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Land Use Change on Non-Federal Land in Western Oregon

1973-2000

May 2002



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LAND USE CHANGE ON NON-FEDERAL LAND IN WESTERN OREGON, 1973-2000



May 2002

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SUMMARY: TRENDS, CHANGES AND POINTS TO PONDER

- As of 2000, 89 percent of the nonfederal land in western Oregon remained in forest and agricultural uses. However, between 1973 and 2000, there were significant shifts in dominant land uses toward more developed categories: low-density residential and urban dominant uses increased; forest and agricultural uses declined.
- More than 80 percent of the shifts in land use were from agriculture or wildland forests to low-density residential or urban areas; farm land continues to be converted to more developed uses at a higher rate than forest land.
- Annualized rates of change in conversion of forest and farm lands to residential and urban uses declined dramatically from the 1973-1982 period to the 1982-1994 period. Comprehensive land use planning in the latter period may have slowed the conversion. The slowdown in the second period coincided with implementation of land use plans and with declines in the *rates* at which population and personal income grew. However, from 1994-2000 rates of development remained relatively low in spite of rapidly increasing population and personal income.
- In the 1982-2000 period, a much larger percentage of lands zoned in comprehensive plans as *developable* then zoned as *resource* changed to urban and low-density residential uses. However, this pattern of development was already apparent for these same lands in the 1973-1982 period, before comprehensive land use plans were adopted.
- Both before and after land use planning, how fast forest or agricultural lands shifted to more developed uses was related to their proximity to more developed areas. The most significant shifts occurred on private land in or near the Willamette Valley, particularly in areas close to the Portland Metropolitan Area.
- Overall, in 2000, significant space seems to exist within areas zoned to accommodate additional development, such as Urban Growth Boundaries (UGBs), even though rural residential areas in some counties and individual UGBs may be substantially developed.
- During the 27-year study period, on land inside UGB's, urban dominant land uses increased from 49 to 67 percent, while agricultural lands declined from 22 to 10 percent. Forest and agricultural lands remaining within developable zones comprise just 2 percent of nonfederal wildland forest, 7 percent of intensive agricultural land, and 7 percent of mixed forest/agricultural land in western Oregon.
- A large majority (65 percent) of western Oregon's private land zoned for forest uses is still free of the effects that population or development might have on forest management. Increases in building density on land zoned for forest use declined after land use laws were adopted and remained at relatively low rates in the 1994-2000 period.
- Oregon's land use program appears successful in reducing the overall rate of conversion of forest and farm lands to more developed uses and has been successful at containing urban expansion within areas zoned for more developed uses. However, dwelling density continued to increase within forest, agriculture, and mixed forest/agriculture dominant uses.
- Low-density residential development appears to affect the potential of these areas for commercial forest management. Small but statistically significant relationships were found between increasing development and decreases in both forest stocking and the likelihood that private forest owners will precommercially thin stands or plant trees after harvest.
- Forest industry and State forests provide many of the ecological and economic benefits enjoyed by residents of western Oregon and visitors alike. Industrial owners produce the bulk of western Oregon's timber supply; State forests, which comprise five percent of western Oregon's forest land, are being managed to provide structural diversity for fish and wildlife species as well as timber.
- The amount and uses of western Oregon's non-Federal forest remained relatively stable in the 1982-2000 period, but the possibility remains that development pressures near forest industry and state forest lands could begin to reduce future economic and ecological benefits produced from these lands.

INTRODUCTION

Western Oregon's forests and agricultural lands are remarkable for their extent, diversity and contributions to the economies and lifestyles of the state; timber, agriculture, and tourism are three of the top four industries. For other industries, quality of life perceptions—partially based on the forest-farm image—provide competitive advantages for attracting the



Wildland forest provides quality of life advantages for Oregon's industries.

best employees. For those residing in our burgeoning metropolitan areas, as well as for visitors, land use policies in rural parts of the state will increasingly affect the ability of these areas to meet the growing demand for recreation, solitude, and other values not available in urban settings. Clearly, maintaining and enhancing the contributions of farm and forest lands is vital to the well-being of all Oregonians.

Future debates about land use issues require a clear, factual understanding of recent land use history. What, then, are the prevailing trends and changes in land use affecting western Oregon's farm and forest lands?

The purpose of this report is to provide the public and policy-makers with a summary of land use changes on western Oregon's non-Federal forests and farms since 1973. The report assesses land use change both

before and after comprehensive land use planning was activated, and refers to the "first period" (1973-1982, before land use planning), the "second period" (1982-1994) and the "third period" (1994-2000). For those interested in more in-depth statistics, the Appendix provides detailed western Oregon tabular information, which has been summarized for this analysis.

This report updates a 1998 publication, *Forests, Farms and People: Land Use Change on non-Federal Land in western Oregon 1983-1994*. The 1998 report on land use change showed that the annualized rates of change in conversion of forest and farm lands to residential and urban uses declined dramatically from 1973-1994. However, the slowdown between 1982-1994, coinciding with implementation of the Oregon land use laws, also coincided with declines in the rates at which population and personal income grew. Therefore, conclusions about the effectiveness of the land use laws in preserving farm and forest lands were uncertain and more analysis was needed.

The analysis in this report includes new information about land use change in western Oregon through the year 2000. The 1994-2000 period combined the elements of strong economic and population growth, and having Oregon land use laws in effect; thus the analysis offers a clearer picture of the efficacy of comprehensive land use planning.



Almost 90 percent of the non-Federal land in western Oregon remains in forest and agricultural uses.

CONTEMPORARY LAND USE POLICY IN WESTERN OREGON

An enduring policy concern has been the conversion of western Oregon's highly productive forests and farms to more developed uses. In response to these concerns, the Oregon Legislative Assembly passed the Land Conservation and Development Act in 1973 to limit the further loss of the most productive of these lands. The Act required all cities and counties to prepare comprehensive land use plans in accordance with statewide land use goals. Statewide goals, Goals 3 and 4, sought to preserve forest and farmlands while designating limited areas for urban expansion and low-density residential, commercial, and industrial uses.

With rapid economic and population growth over the last several decades, demands on forest and farm lands have greatly increased, particularly in western Oregon. However, in spite of the importance of land use issues to Oregonians, increasing demands



Will continued economic and population growth bring with it the conversion of forest and farm lands to more developed uses?



Land use goals seek to preserve farm and forest lands while designating limited areas for urban expansion.

By the early 1980s, most comprehensive plans were completed. Each plan identified lands that were already built on and committed to residential uses. These areas were zoned for continued development while residential expansion into other areas was prohibited, except where this development was consistent with farm and forest goals.

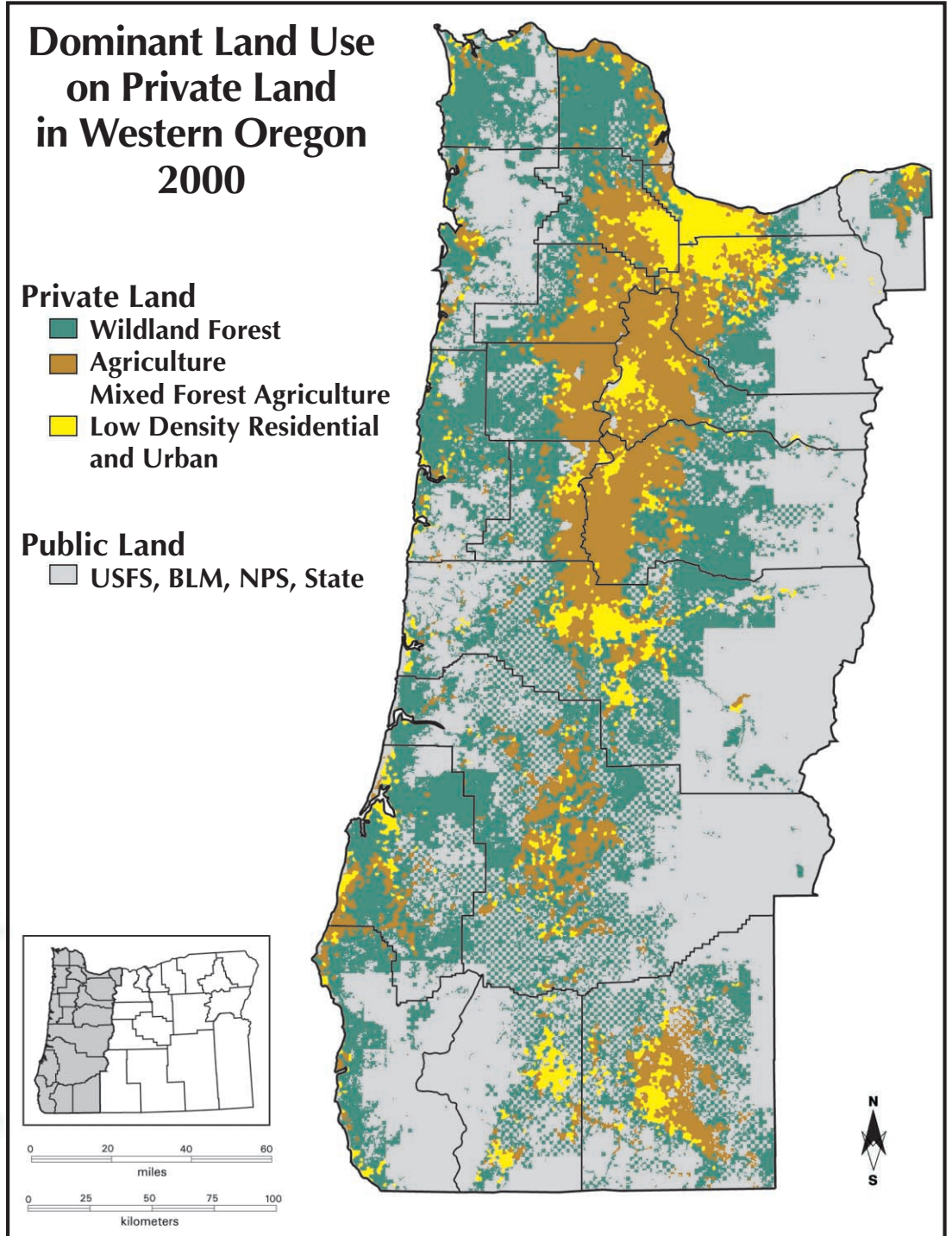
land use plans have been in effect until the 1998 *Forests, Farms and People* publication. This report updates the analysis through the year 2000, and proposes to: 1) look at actual change on the ground (dominant land use); and 2) look at zoning provided by comprehensive land use plans and whether that zoning is achieving its objectives.

APPROACH

This report addresses three key land use issues: 1) changes in the distribution of land across dominant land use classes over time; 2) development patterns occurring within dominant land uses and planned land use zones; and 3) effects that land use changes

are having on forest management practices. The report addresses only non-Federal lands within western Oregon. Land use zoning was obtained from maps of county comprehensive land use plans. Figure 1 shows private land when broken down into three generalized land

Figure 1



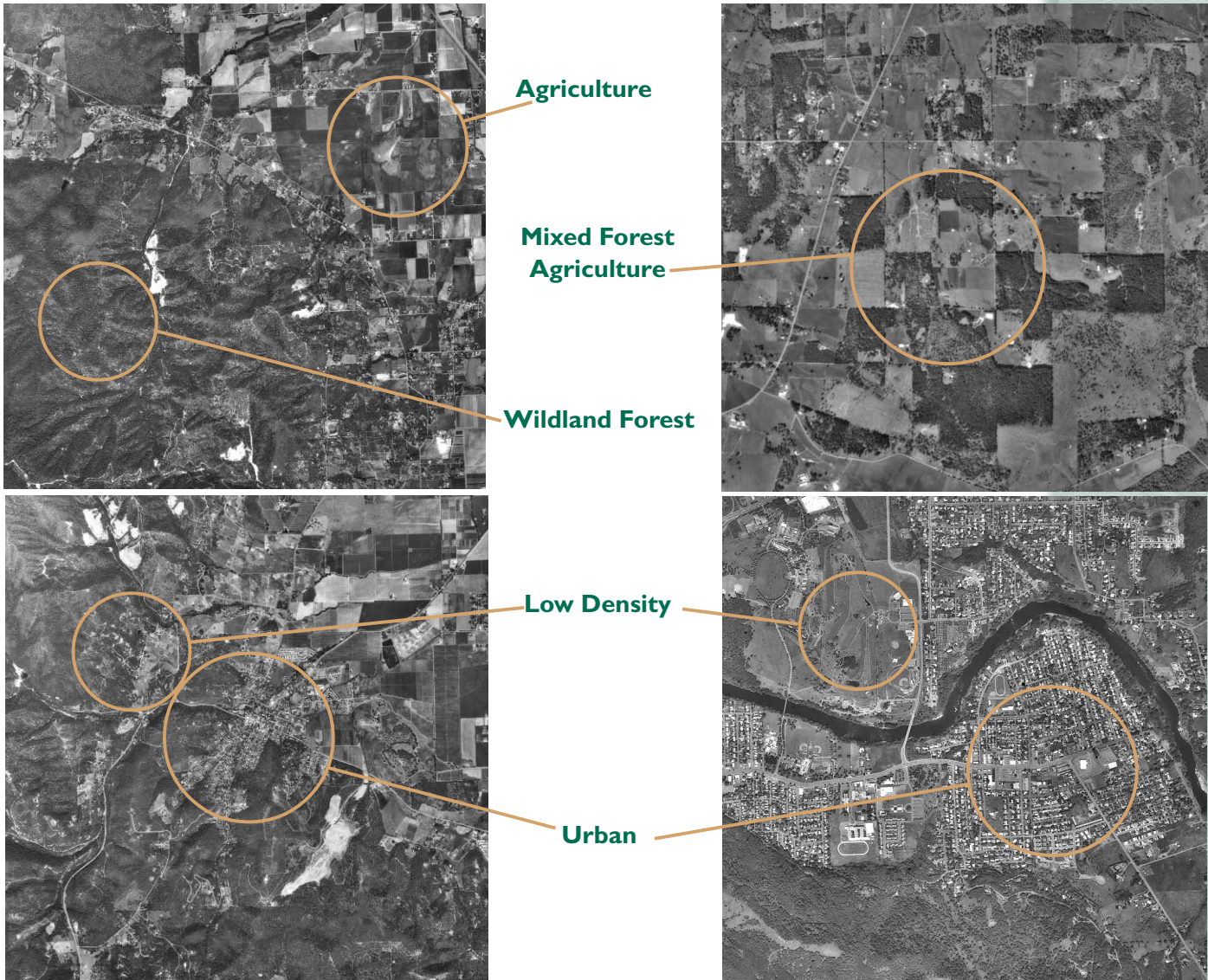
uses: wildland forest, agricultural and mixed forest/agricultural, and low-density residential and urban. Figure 2 illustrates the dominant land use classes used in this report.

Using aerial photographs taken in 1994, we interpreted about 24,000 plots on non-Federal

we repeated the process using the same plots on aerial photographs taken in 2000. By comparing this information at these points in time, we were able to analyze changes in development patterns and land uses.

Dominant land uses were determined by

Figure 2



Nearly 24,000 sample points were evaluated from four dates of aerial photography and assigned into one of five development zones. These zones, interpreted from the photography, were defined by general land use, size, and the degree of development.

land for dominant land use, number of structures, and nearest distance to other dominant uses for the 1998 report. We repeated this process using the same plots on aerial photographs taken in 1973 and 1982. For this report

assigning land uses to plots based on size of the area, number and type of developments, road patterns, and whether the area is forest, agriculture, or range. Dominant land uses categorized in this report include:

Wildland Forest: Large continuous tracts of forest land with fewer than five developments per square mile generally scattered across the area. This designation may include both timberland and other forest land. Timberland is forest land not withdrawn from timber utilization and capable of growing 20 cubic feet or more per acre per year of industrial wood. Forest land, which is of lower productivity or which is withdrawn from timber production, may also be wildland forest.

Intensive Agriculture: Large continuous tracts of agricultural land with fewer than nine developments per square mile generally scattered across the area.

Mixed Forest/Agriculture: Intermixed forest, range, and agricultural lands with fewer than nine developments per square mile scattered across the area.

Low-Density Residential: Forest, agriculture, range, or other non-urban land, or a mixture of these lands, with nine or more developments per square mile within the area.

Urban: Commercial and residential areas greater than 40 acres in size.

Development patterns were interpreted in non-urban areas by recording the density of structures and proximity to other land uses. For this report, density of development was

determined by counting the number of structures within 80- and 640-acre circles surrounding each plot.

Proximity to other land uses was interpreted by recording the nearest distance from each plot to the boundaries of different dominant land uses.

Ownership classification for the approximately 24,000 plots used in this study was derived from information developed for a 1997 inventory of non-Federal forest land in western Oregon. Ownership information specific to 1973, 1982, and 2000 was not determined.

Based on demographic, ecological, and economic characteristics, we partitioned western Oregon into four geographic areas for this analysis (Figure 3): North Willamette



Wildland forest and intensive agriculture lands still have large contiguous tracts with little or no development.

Valley, South Willamette Valley, North Coast, and Southwest Oregon. Areas were delineated by county boundaries to facilitate comparisons with county land use planning efforts.

To show how actual land uses and land use changes related to county comprehensive plans, we divided non-Federal lands into two broad categories, *developable*, such as areas zoned rural residential or urban, and nondevelopable or *resource* areas, such as areas zoned for forest or farm use, based upon the zoning in county comprehensive plans. We then compared areas of dominant land use (i.e., wildland forest, intensive agriculture, etc.) and changes in dominant land use with the generalized zones defined in county comprehensive plans (i.e., farm, forest, rural residential, etc.).

Figure 3



CHANGES IN DOMINANT LAND USES: TYPE, TIMING, AND MAGNITUDE

Eighty-nine percent of non-Federal land in western Oregon remains in forest and agricultural dominant uses. However, there was a shift toward more developed uses between 1973 and 2000 (Tables 1 and 2). More than 80 percent of land use changes in this period were shifts from agriculture or forest to low-density residential or urban uses, with the largest percentage declines occurring in agriculture-related uses. The highest rates of change

occurred on private land in or near the Willamette Valley and in areas close to the Portland Metropolitan Area. Figure 4 shows the distribution of dominant land uses across private land in western Oregon and changes in dominant uses between 1973 and 2000. Figure 5 illustrates the distribution of changes in dominant land uses in western Oregon for the 1973-1982, 1982-1994, and 1994-2000 periods.

Figure 4

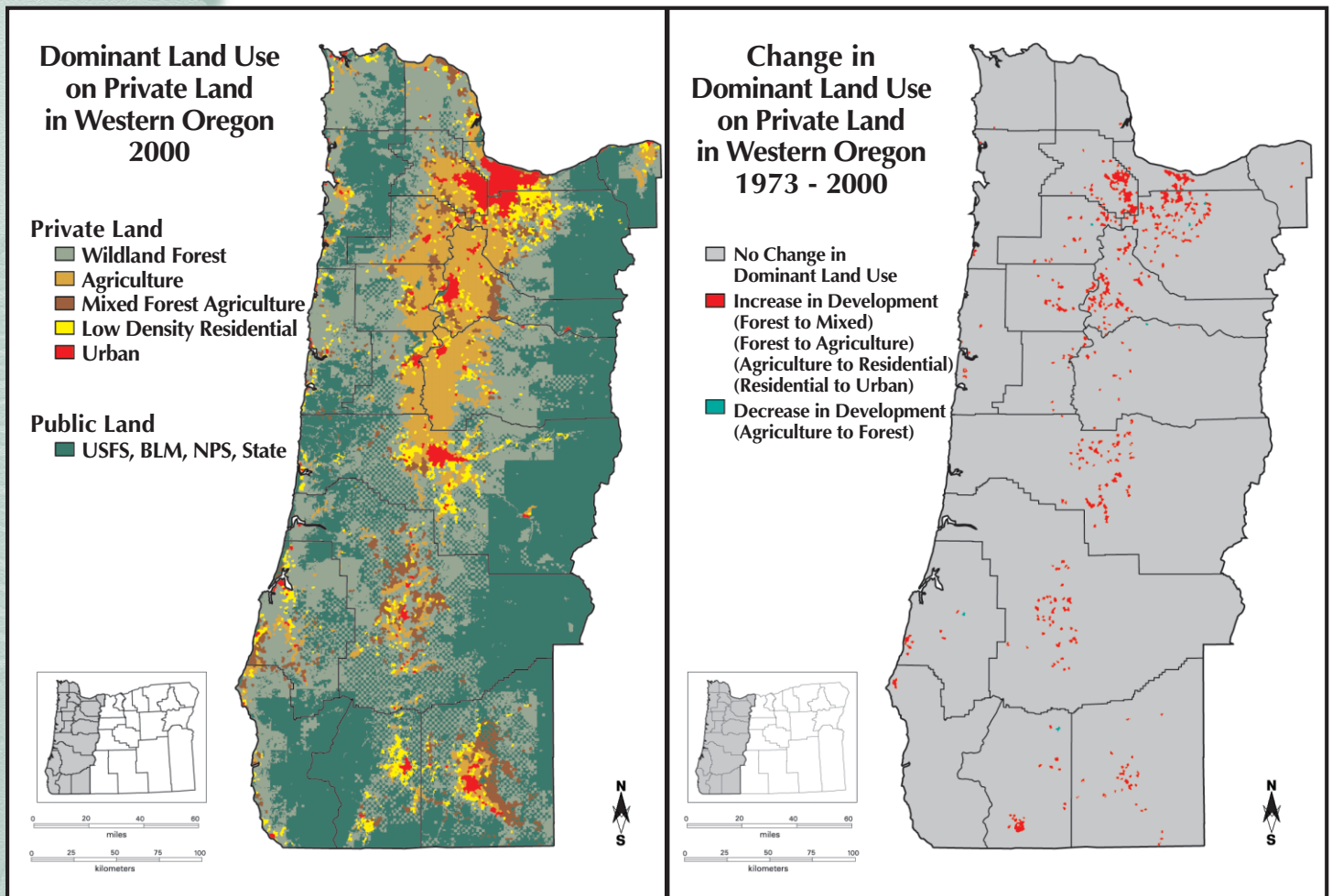


Figure 5

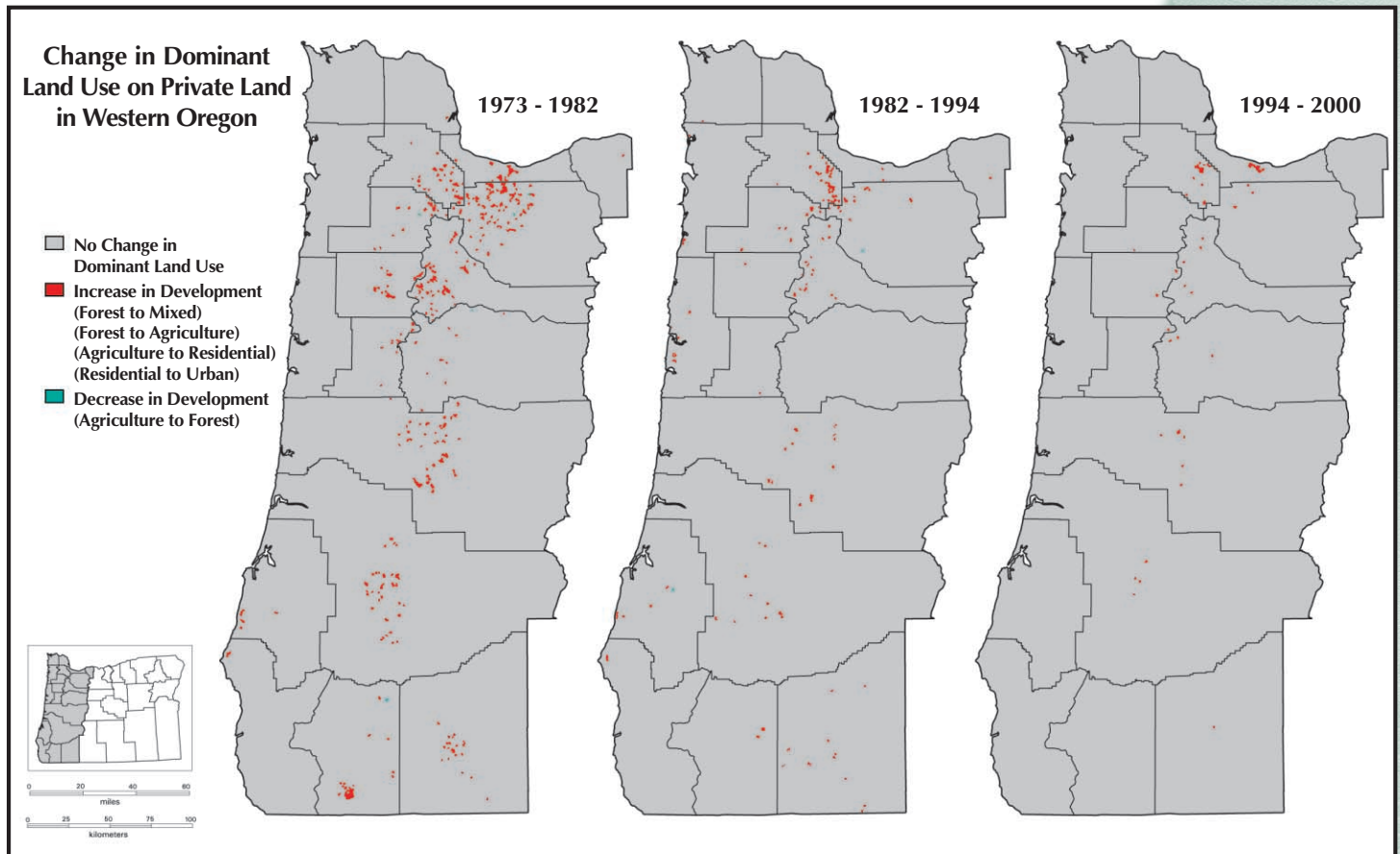


Table 1 – Percentage of Area in Dominant Land Uses, 1973, 1982, 1994, and 2000

Dominant Land Use	1973	1982	1994	2000
Wildland Forest	66.2%	65.3%	65.0%	65.0%
Intensive Agriculture	18.7%	17.8%	17.5%	17.3%
Mixed Forest/Agriculture	7.5%	7.1%	7.0%	7.0%
Low-Density Residential	4.7%	6.4%	6.8%	6.8%
Urban	2.9%	3.4%	3.7%	3.9%
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

Annual rates of change in dominant land uses declined from the 1973-1982 period compared to the 1982-1994 period, as shown in Table 2. Change from intensive agriculture to more developed uses slowed, and the shift from wildland forest to other uses became negligible in the 1982-1994 period. Figure 6 also illustrates the decline in growth of urban and low-

density residential uses between the 1973-1982 and 1982-1994 periods, which coincided with declines in population and personal income growth rates. However, despite increased rates of population and personal income growth during the 1994-2000 period, rates of development of forest and agricultural lands remained well below levels seen prior to 1982.

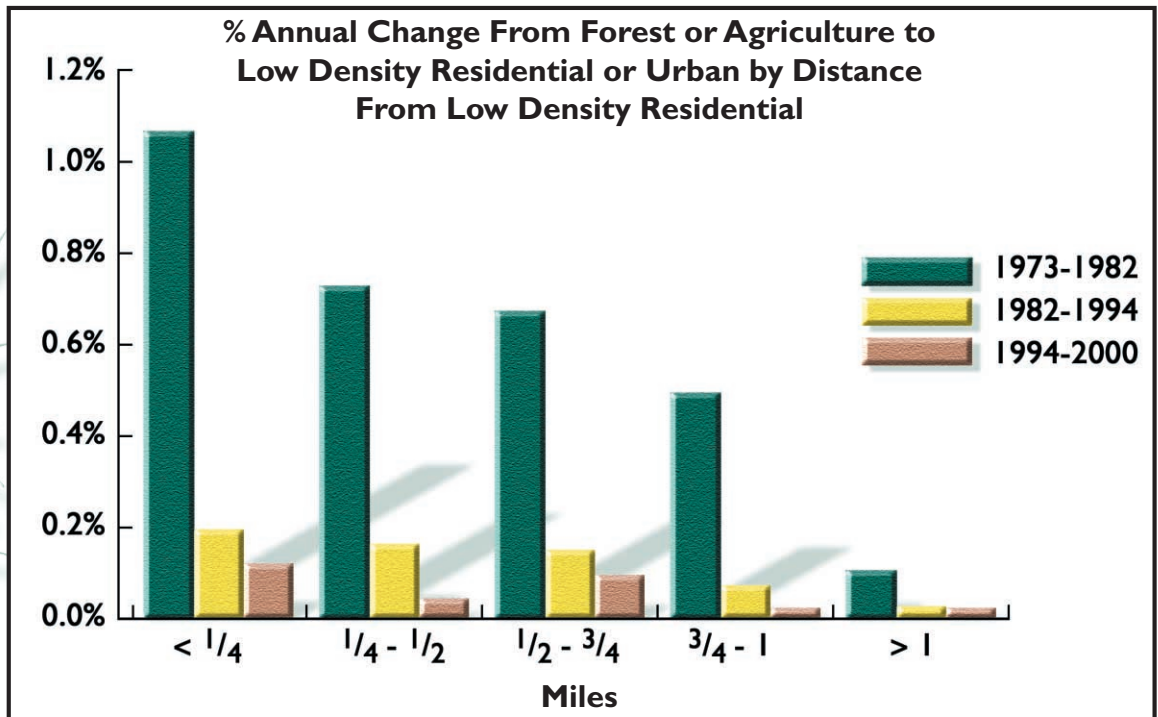
Table 2 – Area and Changes in Dominant Land Use, 1973-2000

Dominant Land Use	Thousand Acres				% Annual Change			Total % Change
	1973	1982	1994	2000	1973-1982	1982-1994	1994-2000	1973-2000
Wildland Forest	7,335	7,238	7,200	7,197	-0.1%	0.0%	0.0%	-2%
Intensive Agriculture	2,076	1,967	1,943	1,924	-0.6%	-0.1%	-0.2%	-7%
Mixed Forest/ Agriculture	832	791	775	774	-0.5%	-0.2%	0.0%	-7%
Low-Density Residential	518	704	751	753	3.5%	0.5%	0.0%	45%
Urban	317	378	407	430	2.1%	0.6%	0.1%	36%
Totals	11,078	11,078	11,078	11,078				

How fast forest or agriculture lands shifted to more developed uses was related to the proximity of the lands to urban or low-density residential areas. Low-density residential uses often surround urban core areas and, as shown in Table 2, expanded by 45 percent between 1973 and 2000. However, expansion of low density residential uses has slowed since 1982.

The closer forest and agricultural land is to urban or low-density residential areas, the more likely it is to be developed. For example, as distance from low-density residential areas increases, rates of development drop, as shown in Figure 6. Forest and agricultural areas less than one-quarter mile from low-density residential areas were five to ten times more

Figure 6

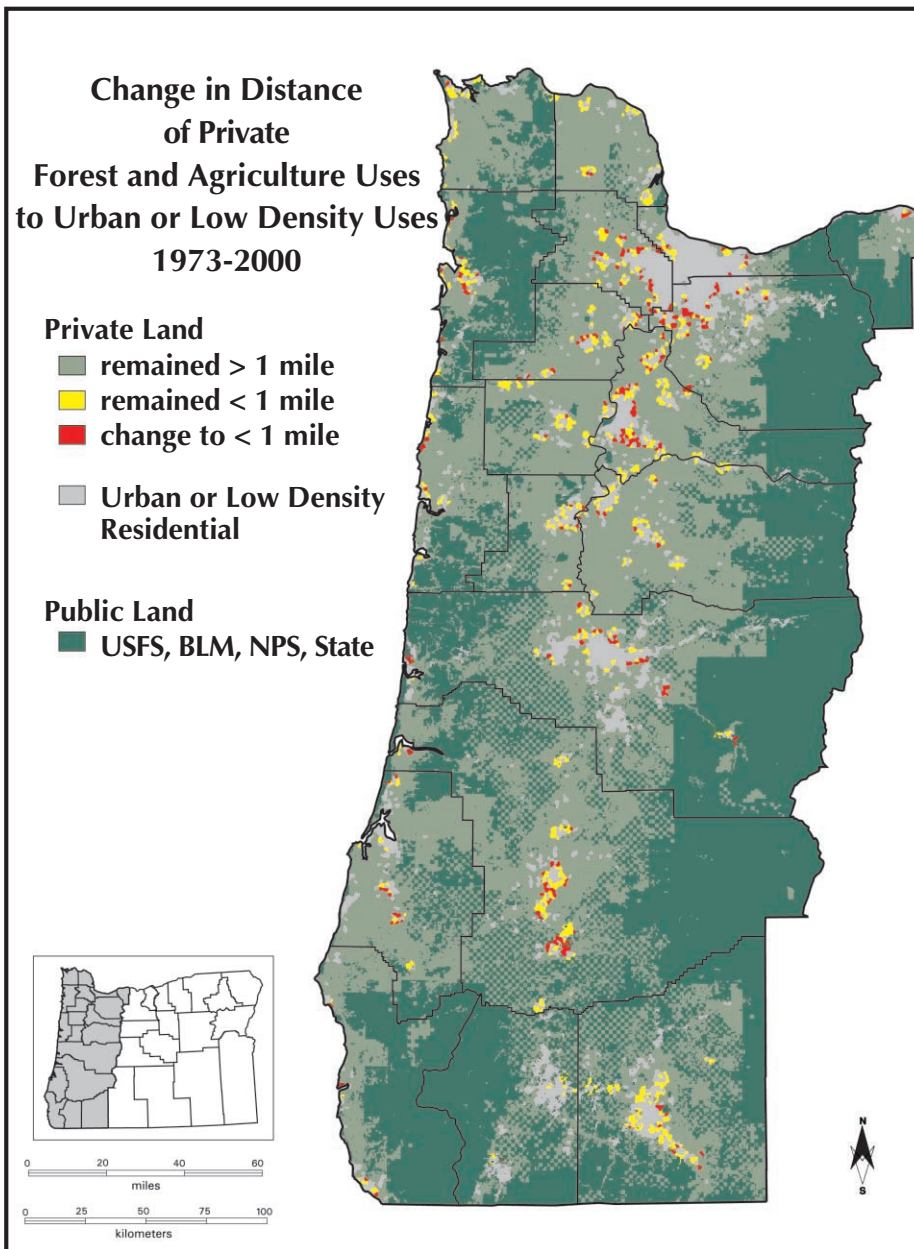


likely to be developed than areas further than one mile from low-density residential areas.

Relatively more farm than forest land continues to be converted to urban and rural residential uses. There is more development pressure on these lands since farmland is generally closer to urban and low-density residential areas. It is thus more likely to be within urban growth boundaries or other areas targeted for development.

Figure 7 shows areas of private forest and agricultural land that shifted from more to less than one mile from urban or low-density residential uses between 1973 and 2000. By 2000, 1,821,000 acres of wildland forest, 1,108,000 acres of intensive agricultural land, and 382,000 acres of mixed forest/agricultural land were within one mile of the low-density residential or urban areas.

Figure 7



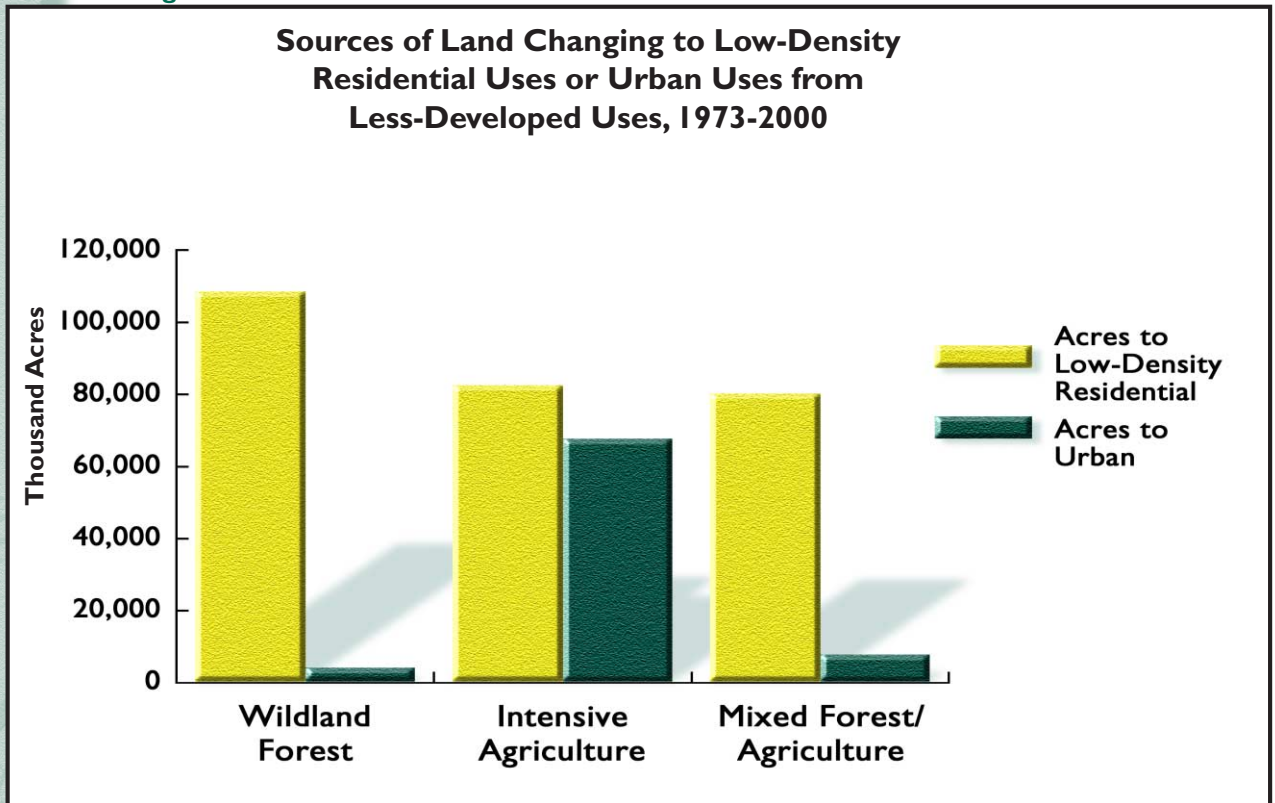
CHANGES IN DOMINANT LAND USES: SOURCES OF CHANGE

In the 1973-1982, 1982-1994, and 1994-2000 periods, almost all changes in dominant use went from less developed to more developed uses (Figures 4 and 5). Figure 8 shows the growth of urban and low-density residential dominant uses by source: wildland forest, intensive agriculture, and mixed forest/agriculture. Other notable changes in land use over the 27-year period are a 25,000 acre change from wildland forest to mixed

forest/agriculture dominant use and a 42,000-acre change from low-density residential to urban dominant use.

Table 3 shows annual acreages shifting from forest and farm dominant uses over the 1973-1982, 1982-1994, and 1994-2000 periods and the uses to which these areas shifted. As previously shown, rates of change slowed from the earlier to the later periods. The slowdown was particularly abrupt in

Figure 8



shifts from the intensive agriculture dominant use from 1973 through 1994, and from forestry-related uses since 1982.

Also revealed in Table 3 is a change in end uses resulting from conversion of forest- and agriculture-related land uses. In the 1982-1994 period, more forest and agricultural land shifted to urban uses and less to low-density residential, compared with the earlier period. The trend of proportionally more land use changes to urban uses and

less to low-density residential uses continued through 2000.

Along with continued urbanization of some low-density residential areas, this supports our assumptions that Oregon's land use program would encourage intensified development in areas that already have some urban influences, while limiting development of the more rural primary forest and agricultural areas.

Table 3 – Changes in Dominant Land Use from Wildland Forest, Agriculture, and Mixed Forest/ Agriculture to Other Dominant Uses, 1973-1982, 1982-1994, and 1994-2000

	1973-1982	1982-1994	1994-2000
Wildland Forest			
Annual Acreage Change/Year	11,000 Acres	3,000 Acres	<1,000 Acres
% of Change to:			
Intensive Agriculture	4%	6%	<1%
Mixed Forest/Agriculture	16%	22%	14%
Low-Density Residential	80%	69%	57%
Urban	<1%	2%	29%
Intensive Agriculture			
Annual Acreage Change/Year	12,000 Acres	2,000 Acres	3,000 Acres
% of Change to:			
Wildland Forest	2%	2%	<1%
Mixed Forest/Agriculture	7%	5%	1%
Low-Density Residential	63%	47%	14%
Urban	28%	46%	86%
Mixed Forest/Agriculture			
Annual Acreage Change/Year	7,000 Acres	2,000 Acres	<1,000 Acres
% of Change to:			
Wildland Forest	1%	5%	<1%
Intensive Agriculture	<1%	4%	<1%
Low-Density Residential	95%	71%	100%
Urban	4%	20%	<1%

CHANGES IN DOMINANT LAND USES: A REGIONAL PERSPECTIVE

The highest rates of change in dominant land use over the entire study period occurred in the north Willamette area and the lowest rates of change occurred in the north coast area (Table 4). In both the north Willamette and southwest regions, the area of low-density residential uses increased by more than 50 percent. In the north Willamette, urban areas increased by 45 percent, and in southwest Oregon and the south Willamette Valley by 25 percent. The two largest declines in area of dominant uses were both in the north Willamette area, with intensive agriculture declining by 9 percent and mixed forest/agriculture declining by 15 percent over the 27-year period.

Most of the increases in low-density and urban areas in the north Willamette and southwest Oregon areas occurred in the 1973-1982 period. Development of forest and agricultural lands continued in the 1982-1994 and 1994-2000 periods, but at a much slower rate.

Counties with the highest rates of loss of forest and agricultural land uses in the first period experienced rapid declines in rates of conversion to more developed uses in the second period. Rates of development declined even further in the third period. As shown in Figures 9 and 10, this was true across a wide geographic dispersion of counties and for both forest and agricultural uses.

Table 4 – Percent Change in Dominant Land Uses, 1973-2000

ANALYSIS AREA	Wildland Forest	Intensive Agriculture	Mixed Forest/ Agriculture	Low-Density Residential	Urban
North Willamette	-2%	-9%	-15%	54%	45%
South Willamette	-2%	-6%	4%	35%	25%
North Coast	0%	-1%	-7%	13%	10%
Southwest	-3%	-4%	-3%	56%	25%
All Western Oregon	-2%	-7%	-7%	45%	36%

Figure 9

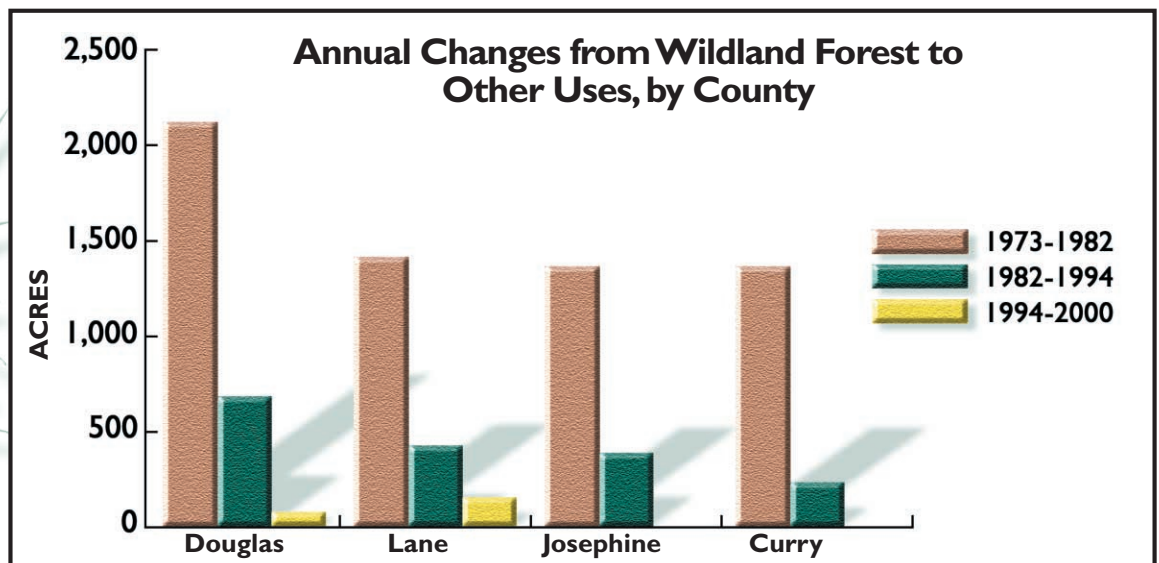
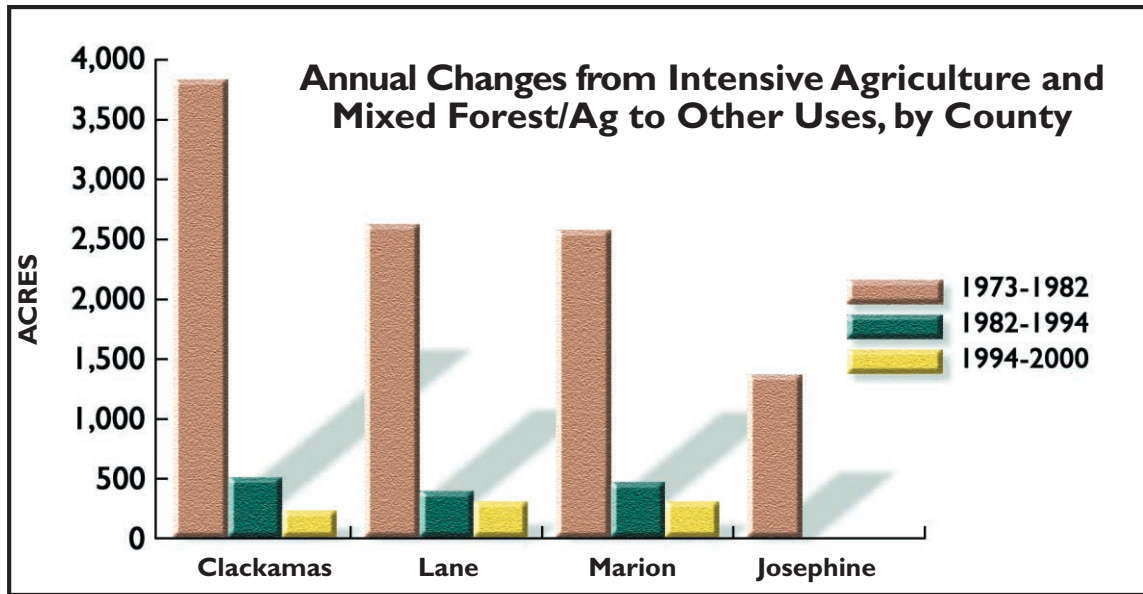


Figure 10



Development of agricultural lands in the Portland Metropolitan counties (Multnomah and Washington) continues at a high rate. In the six-year period between 1994 and 2000, 21 percent of intensive agricultural land in Multnomah County and 5 percent of intensive agricultural land in Washington County was developed into urban uses. All of this land was in areas zoned for development in County Comprehensive Plans.

Relatively small areas of non-Federal wild-land forest—about 2 percent—still remain in areas classified as developable in land use plans

in western Oregon. This percentage varies by geographic region, from 1.3 percent in the south Willamette area to 2.7 percent in the north Willamette area. The percent of developable mixed forest agricultural land also remained constant at about 2 percent. Consistent with historical development patterns and comprehensive land use plans, the area of intensive agricultural land classified as developable in land use plans declined from approximately 8 percent to about 7 percent between 1994 and 2000.



The most significant shifts from forest or farm uses to more developed uses regionally occurred on private land in or near the Willamette Valley.

MORE PEOPLE IN FORESTS AND ON FARMS

It is clear that continued economic and population growth can bring with them the conversion of forest and agricultural lands to more developed uses, although the rate of development in western Oregon has been slowing. They also bring increased development within resource lands. And population has been increasing in western Oregon's non-Federal forests.

Although areas may remain in forest or farm dominant uses, it is possible for average levels of development and population to increase within these dominant uses. To facilitate analysis of changing development within dominant uses, we recorded the density of structures for non-urban dominant uses within 80- and 640-acre circles surrounding the plots used in this analysis. We were then able to track changes in structure counts for lands remaining in a constant dominant land use during the 1973-2000 study period.

Using the structure counts in the 80-acre circles we found that the average number of

structures increased for all non-urban dominant uses over the study period. Similar to changes in dominant land use, increases in structure count continued through both the 1973-1982 period and the 1982-1994 period, but at a much lower rate in the second period. As shown in Table 5, the largest percentage change in structure counts was the almost doubling of structures in wildland forest during the 1973-1982 period. Percentage increases in structure counts declined in the second period for all uses, with rates of development in mixed forest/agriculture uses declining the least.

Structure counts continued to increase for all non-urban dominant uses in the 1994-2000 period, with the rate of change remaining low compared to the 1973-1982 period.

How the increasing population in non-urban areas relates to land use planning efforts and forest resource use is examined in the latter part of this report.

Table 5—Structure Counts per 80 Acres by Dominant Land Use, 1973-2000

Dominant Land Use	Structure Counts per 80 Acres				% Annual Change			% Change
	1973	1982	1994	2000	1973-1982	1982-1994	1994-2000	1973-2000
Wildland Forest	0.23	0.38	0.47	0.53	5.6%	1.7%	1.9%	127%
Intensive Agriculture	1.97	2.55	3.02	3.33	2.9%	1.4%	1.6%	69%
Mixed Forest/Agriculture	1.25	1.71	2.19	2.49	3.4%	2.1%	2.1%	98%
Low-Density Residential	9.31	12.45	14.92	16.57	3.3%	1.5%	1.7%	78%

Note: Includes structure counts for land remaining in the same dominant land use between 1973 and 2000.

COMPREHENSIVE LAND USE PLANNING AND DOMINANT LAND USES

One explanation for the slowdown in loss of farm and forest land shown in this report is that, in general, the land use program has slowed the conversion of farm and forest land to residential and urban uses.

Comprehensive planning normally took into account existing dominant land uses and sought to encourage and direct development to designated “developable” areas, while slowing development in areas outside identified urban growth and exception area boundaries. Land was zoned as *developable*, which included Urban Growth Boundaries (UGBs), rural residential, commercial, and industrial

uses; or as *resource* (non-developable), which included commercial farm, forest, and mixed agriculture/forest uses. Twenty-seven percent more intensive agricultural land than wildland forest was zoned as developable, while wildland forest accounted for four times more resource land than did agricultural land.

On lands zoned for resource use, wildland forest or agriculture was the dominant land use on 90 percent of the non-Federal land in western Oregon in both 1994 and 2000. Mixed forest/

agricultural uses accounted for an additional 7 percent of the total area. Only 3 percent of the land zoned for resource uses was occupied by low-density residential and urban uses.

Table 6 shows the areas in 1994 and 2000 of



Resource lands under comprehensive planning included commercial farm, forest, and mixed forest/agriculture uses.

non-Federal land by dominant land use and whether the land is zoned in comprehensive plans as developable or as resource land (i.e., zoned for commercial farm or forest use). In areas zoned for development, 333,000 acres—30 percent of the land—was still used for agriculture or forestry in 2000. More than 2 percent of the developable land went from forest or agriculture to more developed uses over the 6-year period. Urban uses in developable zones increased by more than 5 percent, mostly from agriculture.

Table 6 – Area of Dominant Land Use in Developable and Resource Zones, 1994 and 2000, Thousand Acres

Dominant Land Use	Developable Zones		Resource Zones	
	1994	2000	1994	2000
Wildland Forest	145	143	6,931	6,929
Intensive Agriculture	153	135	1,715	1,714
Mixed Forest/Agriculture	57	55	715	715
Low-Density Residential	381	382	322	323
Urban	388	409	8	10
Total	1,124	1,124	9,691	9,691

Note: Does not include Hood River County nor small parts of eastern Clackamas, Linn, Lane, Douglas and Jackson Counties.

Notably, urban and low-density residential development, both before and after comprehensive land use planning was instituted, occurred predominantly within lands that became zoned as developable. Table 7 shows the annual rates of change in dominant uses for lands which became zoned in comprehensive plans as developable or as resource lands in the early 1980s.

from forest or agricultural uses to low-density residential or urban uses in resource zones declined to below 1 percent annually. As shown in Table 7, during the 1994-2000 period, most land conversion to more developed uses occurred on agricultural land zoned for development in comprehensive plans.

A recurring question about Oregon's land use planning system is whether designating an urban

Table 7 – Percent Annual Change in Dominant Land Uses Within Developable and Resource Zones, 1973-1982, 1982-1994, and 1994-2000

Dominant Land Use	1973-1982		1982-1994		1994-2000	
	Developable	Resource	Developable	Resource	Developable	Resource
Wildland Forest	-2%	0%	-1%	0%	0%	0%
Intensive Agriculture	-4%	0%	-1%	0%	-2%	0%
Mixed Forest/Agriculture	-4%	0%	-2%	0%	0%	0%
Low-Density Residential	3%	5%	0%	1%	0%	0%
Urban	2%	1%	1%	0%	1%	3%

Notes: Does not include Hood River County nor small parts of eastern Clackamas, Linn, Lane, Douglas, and Jackson Counties. There is very little land in urban dominant uses in resource land: the 3% increase in urban dominant land use in resource land between 1994 and 2000 is a change of 22,150 acres.

During the 1973-1982 period, the area of low-density residential use in what later became resource lands increased by about 5 percent per year, from a total of 181,000 to 290,000 acres. During the 1982-1994 and 1994-2000 periods, after the land use plans had taken effect, the shift

growth boundary (UGB), in essence a “donut” for urban expansion around cities, is an effective method to retain investment in the urban core, or whether the approach merely leads to “urban sprawl within the donut.” Our analysis to date shows reductions in the rate of development for both developable and resource lands after comprehensive plans were prepared.

One possible explanation for the reductions in overall development is that land use plans may have achieved the goal of reducing “sprawl” and confining additional building to areas already used for some type of development. However, it is not known how land use planning may have changed patterns of development that otherwise would have occurred. Before sound conclusions can be reached, additional statistical work needs to be done using variables



Developable lands under comprehensive planning included Urban Growth Boundaries, designated to prevent “sprawl” from encroaching on forest and farm lands.

Table 8 – Acreage of Dominant Land Uses Within Developable Zones, 1973, 1982, 1994 and 2000, Thousand Acres

Dominant Land Use	1973 (Prior to Comprehensive Plans)	1982	1994	2000
Wildland Forest	189	154	145	143
Intensive Agriculture	240	172	153	135
Mixed Forest/Agriculture	99	70	57	55
Low-Density Residential	296	369	381	382
Urban	301	359	388	409
Total	1,124	1,124	1,124	1,124

Note: Does not include Hood River County nor small parts of eastern Clackamas, Linn, Lane, Douglas, and Jackson Counties.

such as population, personal income, and the supply and demand of land for different uses.

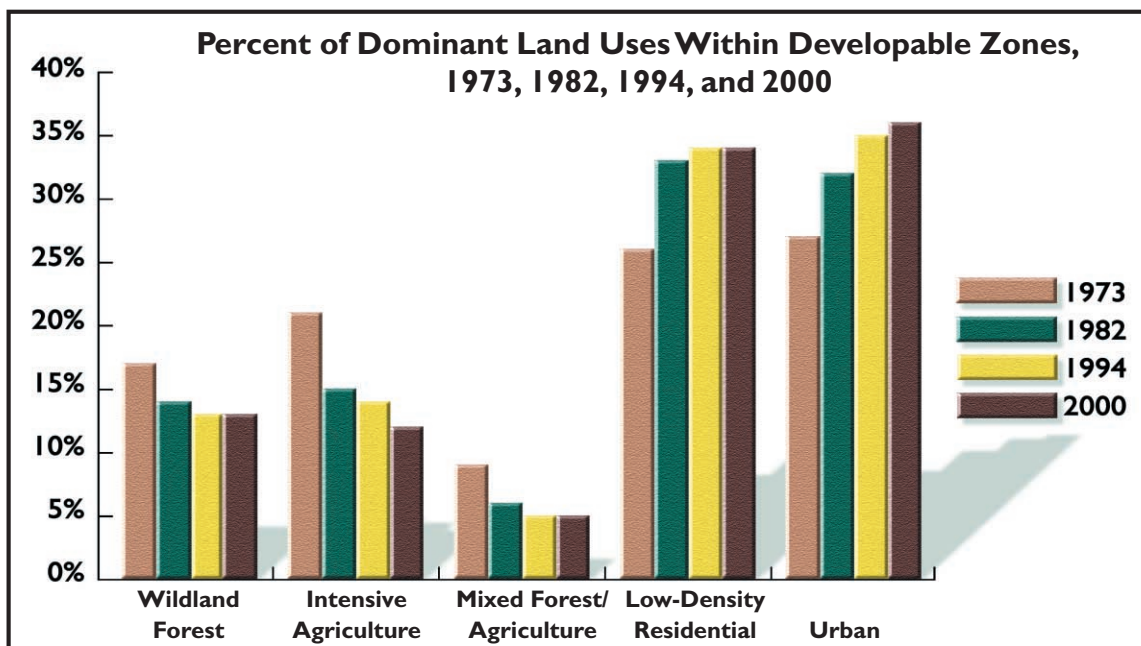
Predictably, lands allocated for development showed a drop in acreages of forest and agricultural lands and an increase in low-density residential and urban uses (see Table 8). As of 2000, of the total 1,124,000 acres in developable zones, 791,000 acres were within low-density residential and urban uses. Thus 333,000 acres remained in forest or agricultural uses.

Between 1973 and 2000, the area of low-density residential and urban dominant uses increased from 53 percent of the developable

land to 68 percent. The remaining developable land is evenly divided between forest and agricultural uses. The rural residential areas in some counties and areas within individual urban growth boundaries may be substantially developed, but taken as a whole, in 2000 there seemed to be significant additional room for expansion and development within areas that were zoned specifically as developable.

Figure 11 shows the changing percentages of dominant uses within areas zoned as developable for the years 1973, 1982, 1994, and 2000.

Figure 11





State forests, which comprise 5 percent of western Oregon's forest land, are being managed to provide structural diversity for fish and wildlife species as well as timber.

Table 9 shows areas of wildland forest, intensive agriculture, and mixed forest/agriculture in the five analysis areas and in all western Oregon, zoned either for resource use or available for development in comprehensive plans. Relatively more of western Oregon intensive agricultural and mixed forest/agricultural land—8 and 7 percent respectively—is in areas zoned for development than is the 2 percent of wildland forest zoned for development. The north Willamette Valley has the largest

area in agricultural dominant uses: 946,000 acres, of which 81,000 is developable. Thus 9 percent of the agricultural land is within developable zones, compared with 7 percent across the whole of western Oregon. The 81,000 acres also represent 60 percent of developable intensive agricultural land in western Oregon. The area of developable agricultural land in the Willamette Valley declined by 13 percent in the 6-year period between 1994 and 2000.

Table 9 – Areas of Wildland Forest, Intensive Agriculture, and Mixed Forest/Agriculture Zoned as Developable and Resource Areas in Comprehensive Plans, Thousand Acres, 2000

Analysis Area	Land Use Classification	Wildland Forest	Intensive Agriculture	Mixed Forest/Agriculture
North Willamette	Resource	1,247	865	233
	Developable	34	81	23
South Willamette	Resource	1,496	595	48
	Developable	19	33	7
North Coast	Resource	1,336	46	36
	Developable	32	6	4
Southwest	Resource	2,851	207	399
	Developable	57	16	21
All Western Oregon	Resource	6,929	1,714	715
	Developable	144	135	55

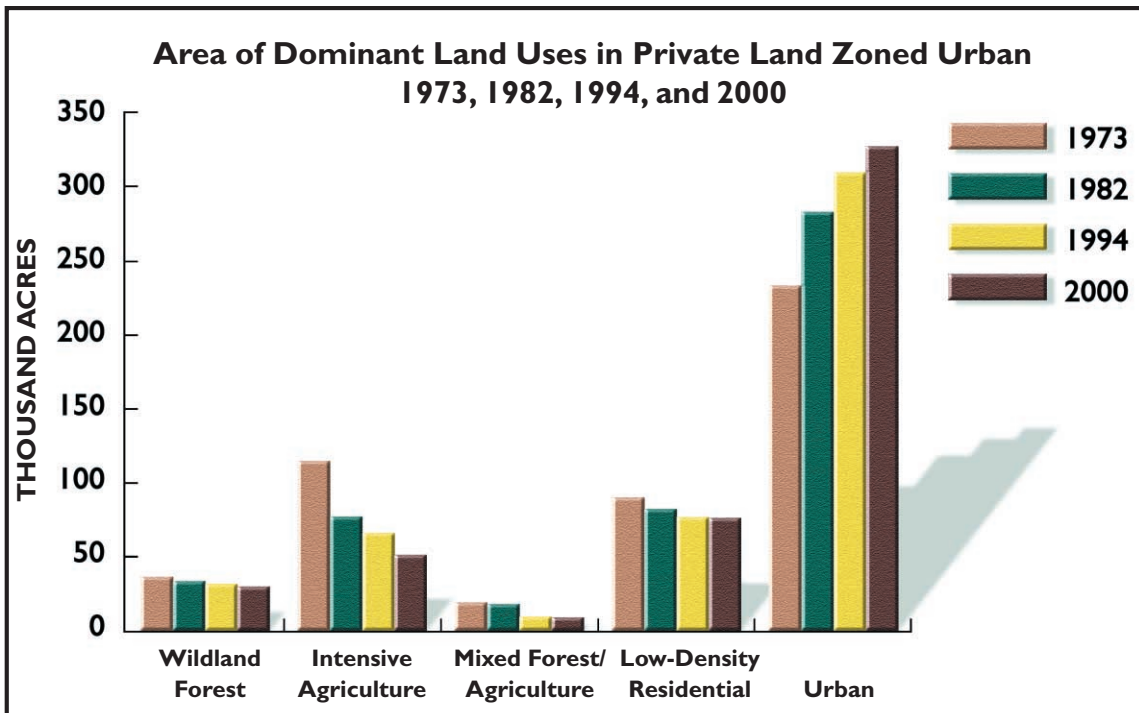
Note: Does not include Hood River County nor small parts of eastern Clackamas, Linn, Lane, Douglas, and Jackson Counties.

DIRECTING GROWTH: URBAN AND RURAL RESIDENTIAL EXPANSION

The two largest areas of land zoned as developable are lands zoned for urban and rural residential uses. On the 584,000 acres of non-Federal lands within the UGBs of western Oregon, we found the urban dominant land use increasing rapidly between 1973 and 2000, from 49 to 67 percent of the urban zoned area. Other dominant land uses in UGBs were declining. Intensive agricultural lands, for example, declined from 22 to 10 percent of the area.

pattern of development for private lands zoned urban is similar to that when non-Federal public lands are included, with urban uses increasing from 47 percent to 66 percent of the area within UGBs. In 2000, of the 493,000 acres of privately owned lands zoned as urban, 76,000 acres of low-density residential uses, 51,000 acres of intensive agriculture, 30,000 acres of wildland forest, and 9,000 acres of mixed forest/agriculture remained in non-urban dominant uses.

Figure 12



Areas of low-density residential use occupied 15 percent of the area inside UGBs in 2000, with 86,000 acres, and have overtaken intensive agricultural lands, with 57,000 acres, as the second largest use in urban zones. Forty thousand acres of wildland forest and 12,000 acres of mixed forest/agriculture also remain in areas zoned as urban.

Approximately 84 percent of the non-Federal area zoned as urban in the comprehensive plans is privately owned. As shown in Figure 12, the

Of the 453,000 acres of non-Federal lands zoned as rural residential, low-density residential and urban dominant uses have increased dramatically, by 61 and 80 percent respectively. Other dominant uses have declined. Even so, in 2000, urban dominant uses in these lands still accounted for only 2 percent of lands zoned as rural residential. In contrast, low-density residential dominant uses accounted for 60 percent of the rural residential landbase.

Often on the fringes of urban areas, lands later zoned as rural residential saw a particularly rapid increase in low-density residential dominant uses between 1973 and 1982, absorbing land from both forest and agricultural uses. Wildland forest, intensive agriculture, and mixed forest/agriculture dominant uses all declined



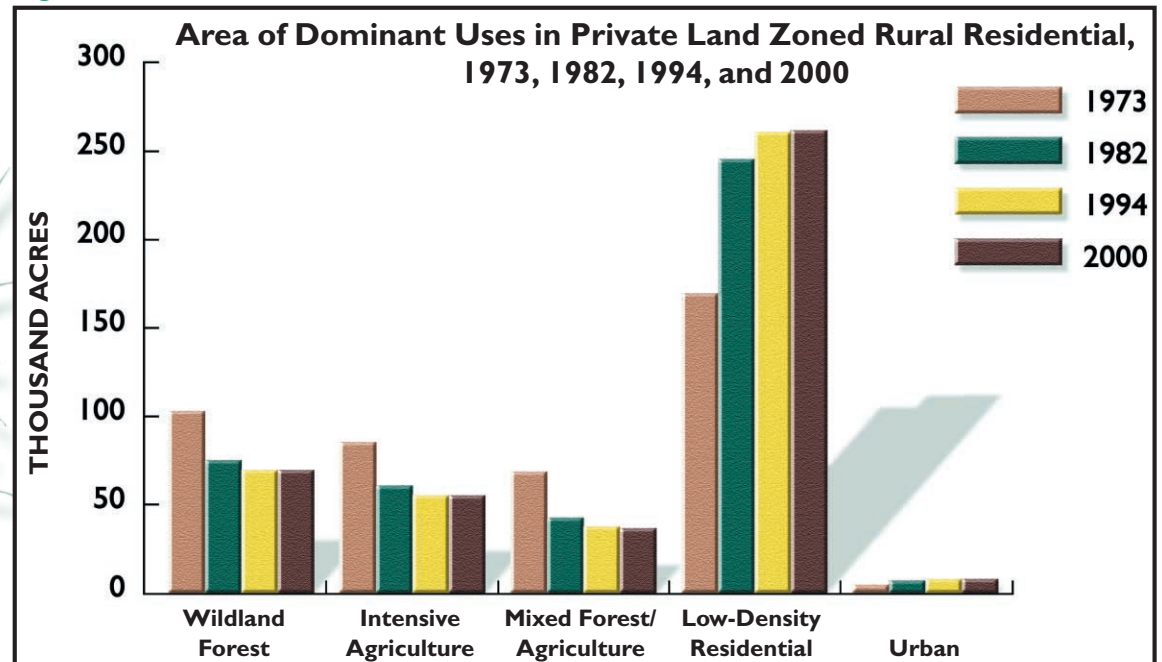
Both before and after land use planning, forest or agricultural lands distant from urban or residential areas were less likely to be developed.

in this period and again through 1994. In 1994 they accounted for a combined 173,000 acres in rural residential zones, 38 percent of the total area. The rate of change in dominant land use began to slow in the 1982-1994 period. This slowdown in land use changes continued through the 1994-2000 period.

Approximately 95 percent of non-Federal rural residential lands are privately owned. As shown in Figure 13, the pattern of development was similar to that when non-Federal public lands were included. Urban dominant uses

increased from 1 percent to 2 percent of the total area zoned rural residential, and the area in low-density residential uses increased from 39 percent to 61 percent over the 27-year study period. In 2000, of the 431,000 acres of privately owned lands zoned as rural residential, 70,000 acres of wildland forest, 55,000 acres of intensive agriculture, and 37,000 acres of mixed forest/agriculture remained. Two-hundred and sixty-two thousand acres of low-density residential commercial uses and 8,000 acres of urban dominant uses made up the remainder of areas zoned as rural residential.

Figure 13





Notably, if all forest and agriculture lands within developable zones are converted to non-resource uses, only 2 percent of total non-Federal wildland forest, 7 percent of total agricultural land, and 7 percent of total mixed forest/agricultural land in western Oregon would be developed. The proportion of wildland forest located in the developable zones is small and relatively constant, but 63 percent of it is in private ownership and is most likely to be converted to nonforest uses. The percentage of the various dominant land uses that occur in developable areas (i.e., areas inside UGBs or zoned as rural residential, industrial, or commercial) is shown in Table 10.

Farm land continues to be converted to more developed uses at a high rate only in areas designated for development.

Table 10 – Percentage of Total Areas of Dominant Land Uses That Are in Developable Zones, 1973, 1982, 1994, and 2000

	1973	1982	1994	2000
Wildland Forest	3%	2%	2%	2%
Intensive Agriculture	12%	9%	8%	7%
Mixed Forest/Agriculture	12%	9%	7%	7%
Low-Density Residential	57%	52%	51%	51%
Urban	95%	95%	95%	95%

OWNER CLASS AND CHANGES IN FOREST LAND USE

Oregonians are increasingly dependent on non-Federal forest landowners to provide most of the commodity resources produced from Oregon's forests. In this report we focus primarily on changes in dominant land use (i.e., wildland forest), but it is also important to track changes in forest use and ownership patterns based on the productivity of the land to produce desired forest commodities. We can better understand changes in the productivity of forest land by following changes in timber-

land area. Timberland excludes the least productive forest land, commonly called noncommercial forest land, so it gives us another measure of changes in forest productivity caused by forest land development. Also, we are better able to track changes in ownership for timberland than for dominant uses.

Most of western Oregon's non-Federal forests are owned and managed by industrial forest owners, as shown in Table 11. Nonindustrial owners manage approximately

Table 11 – Percentage of Non-Federal Timberland and Wildland Forest by Owner Class

	Forest Industry	Nonindustrial Private	Other Public
Timberland, 1997	61%	27%	12%
Wildland Forest, 2000	61%	24%	15%
Changes in Wildland Forest, 1973-2000	0%	-6%	-1%
Changes in Timberland, 1973-1997	11%	-23%	-1%

Note: While highly correlated, timberland and wildland forest acreages are different. Timberland is forest land capable of growing 20 cubic feet or more per acre per year of industrial wood and not withdrawn from timber utilization. Wildland forest is based on dominant use of the land and does not depend on productivity or availability for growing and harvesting timber. Forest land which is of lower productivity or which is withdrawn from timber production may also be wildland forest.



Forest industry and State forests provide many of the ecological and economic benefits enjoyed by residents of western Oregon and visitors alike.

one-quarter of western Oregon's non-Federal timberland, with an additional 12 percent being managed by non-Federal public owners.

Forest industry and State forests provide many of the forest-related benefits enjoyed by residents of western Oregon and visitors alike. Industrial owners produce far more of Oregon's timber supply than do nonindustrial private owners in western Oregon. For example, in 2000 the forest industry provided 74 percent of western Oregon's timber harvest from less than 50 percent of the total federal and nonfederal timberland; nonindustrial private

owners produced 11 percent of the timber harvest. State forests, comprising most of the non-Federal public timberland in western Oregon, are currently being managed to provide structural diversity for fish and wildlife species as well as timber. Although comprising only 5 percent of western Oregon's total Federal and non-Federal forest land, state forests will continue to provide benefits not available from other non-Federal lands. Development or conversion of western Oregon's forest industry and state forests could seriously reduce future economic and ecological benefits produced from these lands.

Industrial, non-industrial, and non-Federal public timberland areas are compared over the study period in Table 11. This table shows the large shift from nonindustrial to industrial ownership of timberland in western Oregon from 1973-1997. We were unable to detect a similar change in wildland forest ownership over time because wildland forest ownership was available for only one year, 1997.

Highly correlated with timberland, wildland forest area (see Table 11 Note, page 26) showed relatively small declines in total area occurring over the study period, mostly prior to 1982. Approximately 300 acres per year of industrial land and about 100 acres per year of other public land shifted from wildland forest to other uses in the 1982-2000 period. Most of the declines in forest occurred on the nonindustrial private ownership in the 1973-82 period, but even on the nonindustrial private ownership, annual losses of wildland forest dropped from 9,400 acres per year during the 1973-1982 period, to less than 400 acres per year during the 1994-2000 period.

Unlike for forest lands, data available for this report did not have meaningful ownership class distinctions for agricultural lands. Therefore, we were unable to correlate ownership classes with changes in agricultural land use and production.



An enduring policy concern has been the conversion of western Oregon's highly productive forests and farms to more developed uses.

PEOPLE IN FORESTS: NEW PRESSURES ON MANAGERS

Forestry policymakers have several concerns about the impact of housing development on forestry in rural areas. One concern is that housing development will break up existing forestland into ever-greater numbers of smaller and smaller parcels. For example, Barlow (1998) found that several measures of a higher population led to a decrease in timber harvesting, including proximity to urban land uses, higher population densities, and proximity to urban centers.

Population has indeed been increasing in western Oregon's nonfederal forests. Figure 14

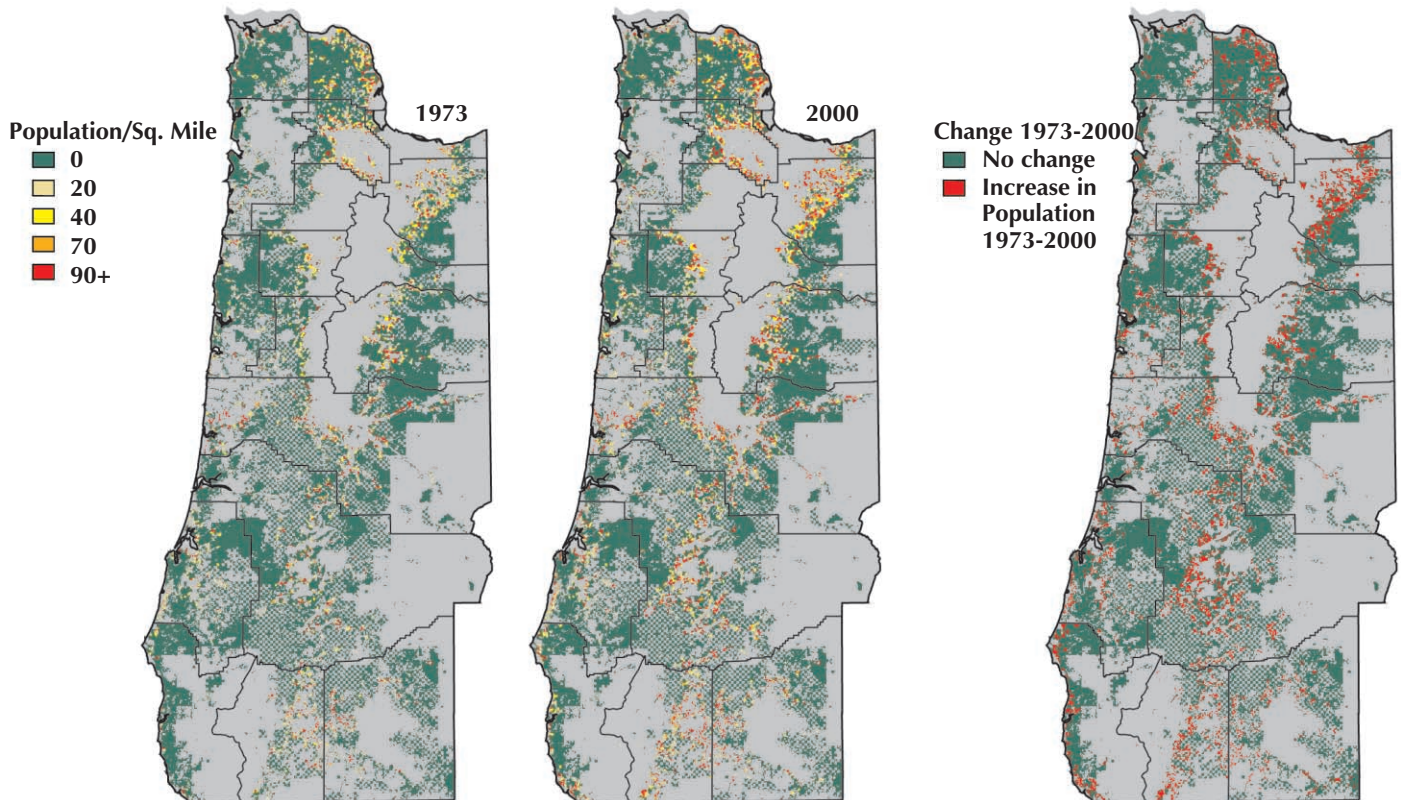


In 2000, forest industry provided 74 percent of western Oregon's timber harvest from less than 50 percent of the timberland.

shows population densities and changes in population densities from 1973 to 2000 on private forest land in western Oregon. The figure suggests that western Oregon is seeing

Figure 14

Population Density and Population Change on Private Forest Land



population increases which in other regions have tended to reduce the probability of active management.

Several studies have suggested that forest management practices change with the size of owners' forest holdings. For example, Row (1978) suggests that economies of scale in timber production mean greater per-acre profits for managing larger forest tracts. Also, Dennis (1989) suggests that nonindustrial private owners in particular are less likely to manage and harvest timber as tract size decreases, because on small parcels they tend to give greater weight to non-timber values such as aesthetics.

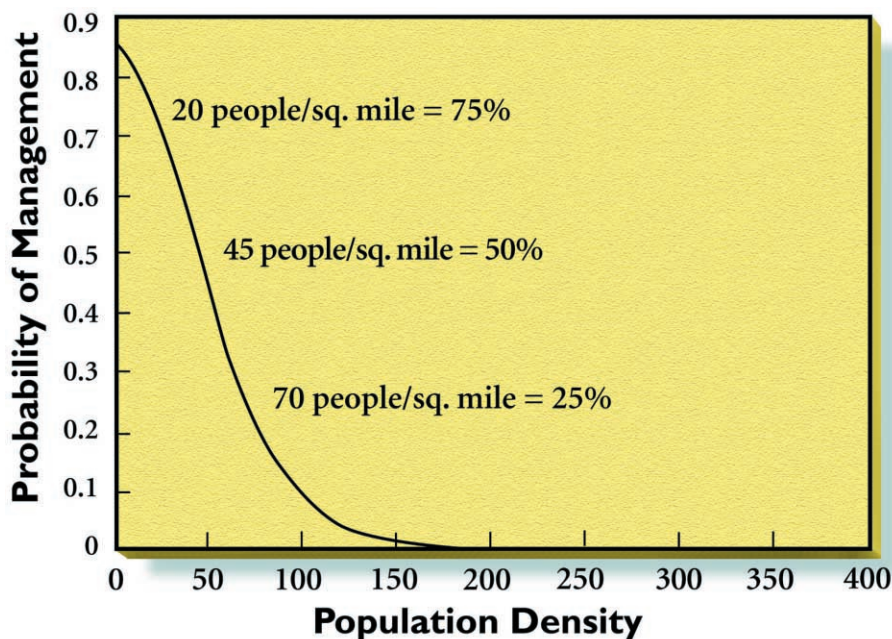
Both studies imply that forest owners will tend to expect lesser net returns from timber production as forest parcels become smaller, and that owners possessing larger tracts would be more likely to manage for commercial timber production. Several studies of actual forest management and harvest activities by nonindustrial forest owners tend to confirm this view (see, for example, Cleaves and Bennett 1995, and Thompson et al. 1981).

A related concern of forestry policymakers regarding the expansion of housing development in rural areas is potential changes in the characteristics of forest owners. As noted, nonindustrial

private owners are believed to base their forest management decisions at least as much on non-timber values, such as aesthetics and recreation, as on timber values, causing them to respond to economic forces in different ways than do other forest land owners. The results of several studies suggest this to be the case (a few examples include Dennis 1989, Kuuluvainen et al. 1996, and Kline et al. 2000, which is specific to Oregon and Washington). Thus the concern is that as housing development expands into rural areas, a greater proportion of remaining forestlands will end up being owned by nonindustrial private owners with smaller parcels and will no longer be managed as intensively for timber production.

Two recent studies have examined the impact of rural housing development on forestry. One study conducted in Alabama and Mississippi found that the proximity of urban development and higher population densities to forestland was correlated with reduced rates of timber harvest (Barlow et al. 1998). Another study, conducted in four counties in Virginia, found that increasing population density was correlated with a lower likelihood of surrounding forestlands being managed for commercial timber production (see Figure 15) (Wear et al. 1999).

Figure 15 - Relationship of Population Density to the Probability of Commercial Forest Management (Adapted from Wear 1999)



Wear found that, “...the probability of forest management approaches zero at about 150 people per square mile (psm). At 70 psm there is a 25 percent chance of commercial forestry. At about 45 psm the odds are 50:50 that commercial forestry will be practiced and at 20 psm there is a 75 percent chance (Figure 15). The implication is that a transition between rural and urban use

of forests occurs between 20 and 70 psm. The results of this study indicate that raw estimates of timberland—based on physical criteria alone—may substantially overstate the availability of timber”.

Wear conducted his analysis in the southeastern United States, and the conclusions may not be precisely applicable to Oregon. Kline and Azuma (2002) used the Wear Study as a basis to evaluate similar trends in Oregon and to answer the following questions: What is the



The rate of conversion of forest and farm lands to more developed uses has been slowing in western Oregon.

likelihood that private forest owners in western Oregon will conduct harvesting, pre-commercial thinning, and planting activities; and does that likelihood vary according to building density? Further, does forest stocking vary by building density? Table 12 shows the density and population classes used to explore how much of Oregon’s private forest land is potentially affected by increased populations in the ranges discussed in Wear’s paper.

Table 12 - Density Classes Based on Estimated Population Density

Density Class	Structure Count Per Square Mile	Estimated Average Population Per Square Mile
0	0	0
1	1 – 3	5
2	4 – 12	20
3	13 – 22	45
4	23 – 37	70
5	37+	90+

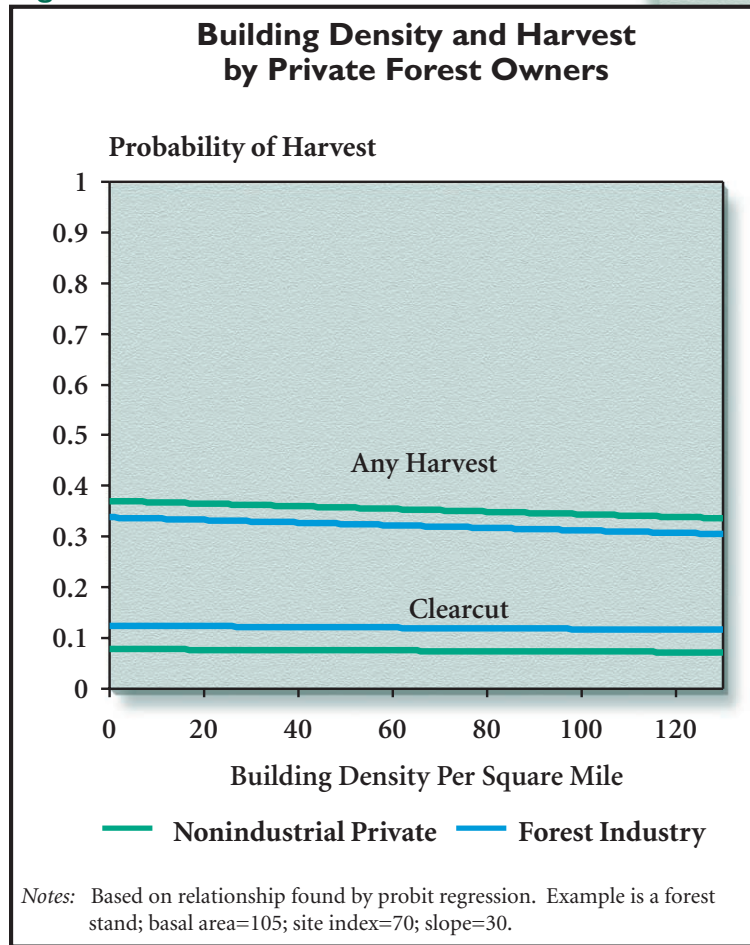
Likelihood of Timber Harvest: If housing development in rural areas has had a negative effect on timber harvesting in western Oregon, we could expect that harvest activities might be less common in more densely populated areas.

Kline and Azuma found the likelihood of any harvest to be influenced by the present value of the stand, slope, and the distance of the stand to existing roads. The likelihood of harvest was greater in the second period than the first, and ownership by nonindustrial private forest owners was not found to have a statistically significant effect on harvest. The study did not find building density to be a statistically significant factor affecting the likelihood that either clearcutting or partial harvest had occurred. Although Figure 16 shows a slight downward trend in the likelihood of harvest as building density increases, that downward trend is not statistically significant.

They also found the likelihood of just clearcutting to be influenced by stand value, site index (the collective influence of soil and climatic factors on the ability of a given site to grow trees), and the distance of the stand to existing roads. Similarly, the likelihood of clearcutting was greater during the second than the first period. In this case the likelihood of clearcutting is also less on forestlands owned by nonindustrial private forest owners (Figure 16).

Furthermore, as with the analysis of clearcutting and partial harvest together, building density was not a statistically significant factor affecting the likelihood of clearcutting as a sole harvest method (Figure 16). Both of these findings run counter to the findings of other studies from the eastern United States, cited above. As before, although Figure 16 shows a slight downward trend in the likelihood of clearcutting as building density increases, that downward trend is not statistically significant.

Figure 16



Forest Stocking: If housing development in rural areas has had a negative effect on timber harvest in western Oregon, we could expect that forest stocking might be lower in more densely populated areas.



Land use policies will increasingly affect the ability to meet the demand for recreation, solitude, and other values.

The forest stocking level was influenced by stand age, site index, whether the stand consisted of conifers or hardwoods, owner type, and building density. In particular, ownership by nonindustrial private owners also was found to contribute to lower overall timber volume (basal area) in stands, compared to stands owned by industrial private owners (Figure 17). The study found building density to have a statistically significant negative correlation with timber volume of forest stands (Figure 17). This result tends to support the notion that housing development in rural areas has had some negative effect on forest stocking in western Oregon.

Likelihood of Pre-Commercial Thinning: If housing development in rural areas has had a dampening effect on forest management activities in western Oregon, we could expect that active forest management, such as pre-commercial thinning, might be less common in more densely populated areas.

The likelihood of pre-commercial thinning appeared to be influenced by stand age, the present value of the stand, site index, the distance of the stand to existing roads, owner type, and building density. Pre-commercial thinning was less likely on stands owned by nonindustrial private forest owners, and building density had a statistically significant

negative correlation with the likelihood of pre-commercial thinning on forest stands (Figure 18). This result tends to support the notion that housing development in rural areas has had a negative effect on active forest management in western Oregon.

Figure 17

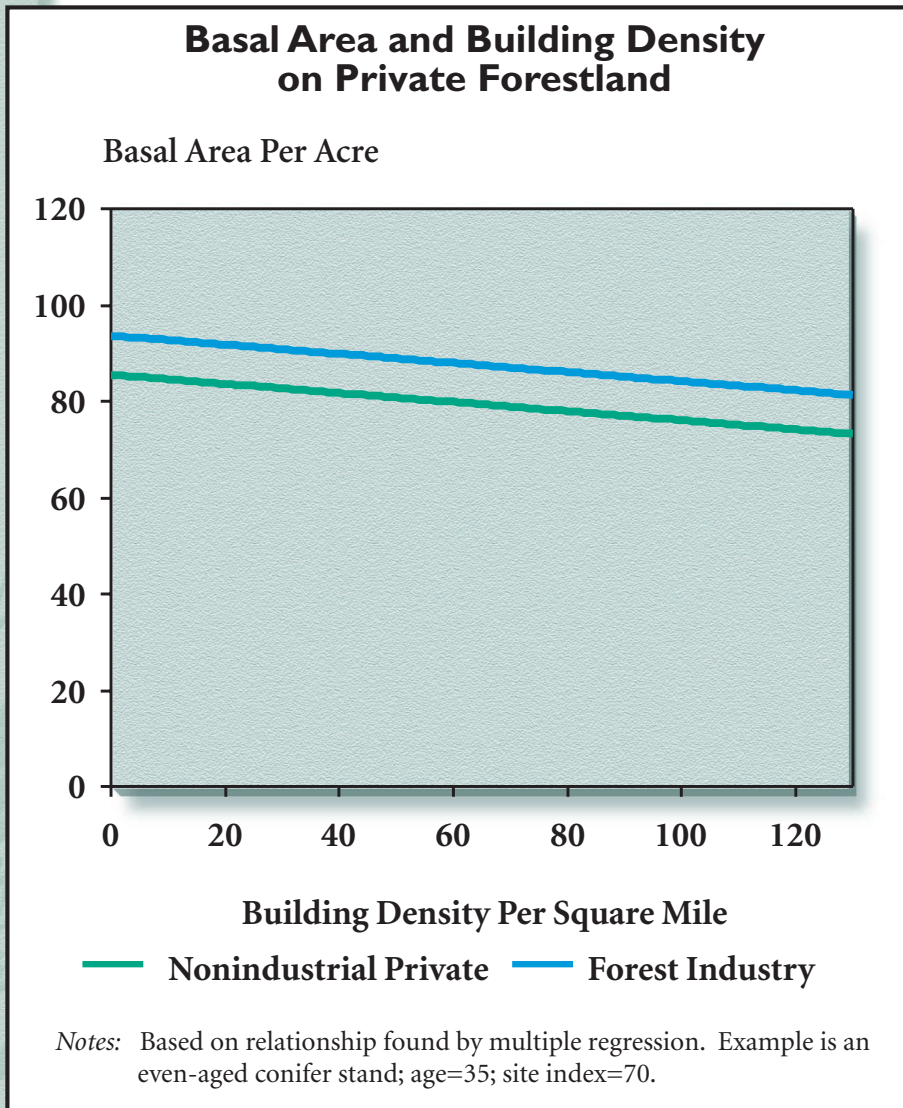
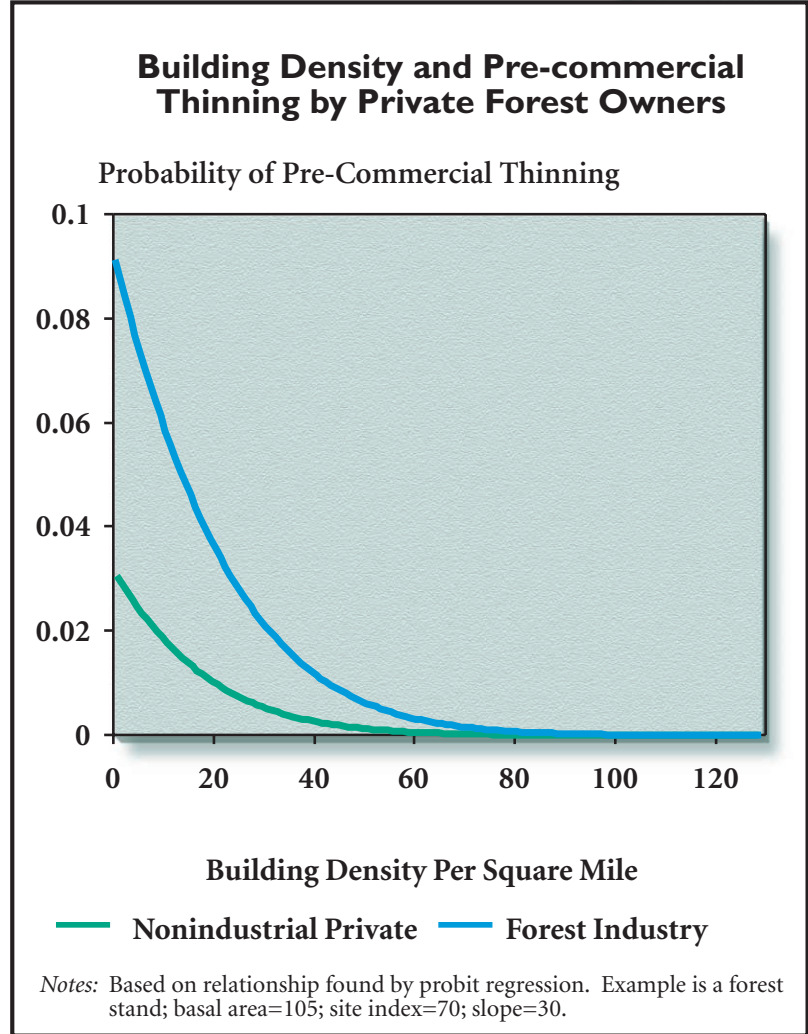


Figure 18

Likelihood of Planting after Harvest: If housing development in rural areas has affected timber management practices in western Oregon, we could expect that investment in forestry by planting trees following harvest might be less common in more densely populated areas.

Kline and Azuma found the likelihood of tree planting following harvest to be influenced by present stand value, site index, the distance of the stand to existing roads, owner type, and building density. Once again, tree planting following harvest was less likely on stands owned by nonindustrial private forest owners, and building density had a statistically significant negative correlation with the likelihood of planting following harvest (see Figure 19 on page 34). Like the findings for pre-commercial thinning and stocking, this result tends to support the notion that housing development in rural areas has had a small but noticeable negative effect on investment in forestry.



More than 80 percent of the shifts in land use in the 27-year study period were from agriculture or wildland forest to low-density residential or urban areas.

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Discussion: The statistical analyses of harvest, forest stocking, pre-commercial thinning, and planting activities on private forestlands in western Oregon indicate that population density does *not* appear to have had a negative impact on harvest activities. However, the analyses suggest that forest stocking, and the likelihood that private forest owners pre-commercially thin stands and plant trees following harvest, does tend to diminish as population density increases.

One potential reason for the weaker relationship between forest management activities and levels of development in western Oregon, when compared to studies by Wear et al. and Barlow et al. in Virginia and Alabama, has to do with the larger proportion of forestland owned by nonindustrial private forest owners near low density residential and urban areas in western

Oregon. Past research in western Oregon and elsewhere has shown that these forest owners tend to manage their forestlands less intensively than do industrial private forest owners.

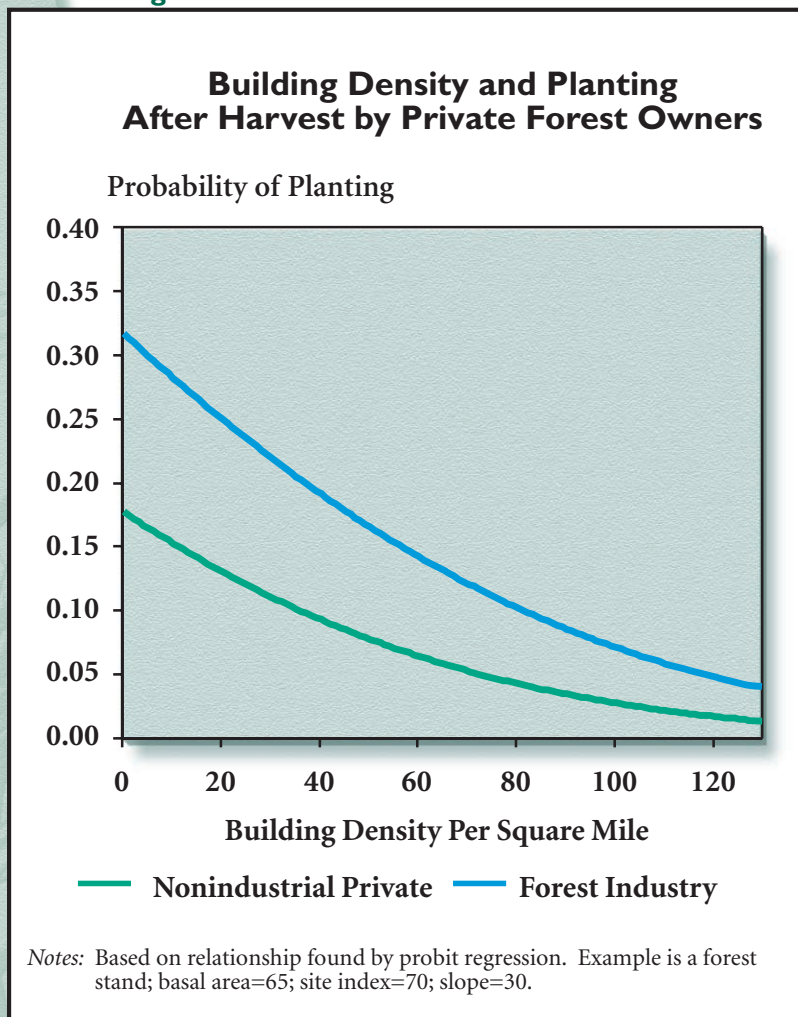
Forestland located near or in low density areas in western Oregon tends to be owned by nonindustrial private forest owners rather than industrial owners. The reason for lower management intensity found in this study on lands located near low density and urban areas could be due in part to their ownership by nonindustrial private owners, in addition to population influences.

Another potential reason for finding a relatively weaker relationship between forest management activities and levels of development in western Oregon is the relatively small number of observations available where forest activities can be observed in low density and

urban settings. It is important to remember that only a small proportion of all forestland in western Oregon is located where such housing development has taken place. Of the sample forested field plots evaluated in our analysis, just 12 percent of plots were located in areas having a building density over 10 buildings per square mile. Only 1 percent of plots were located in areas having a building density over 64 buildings per square mile.

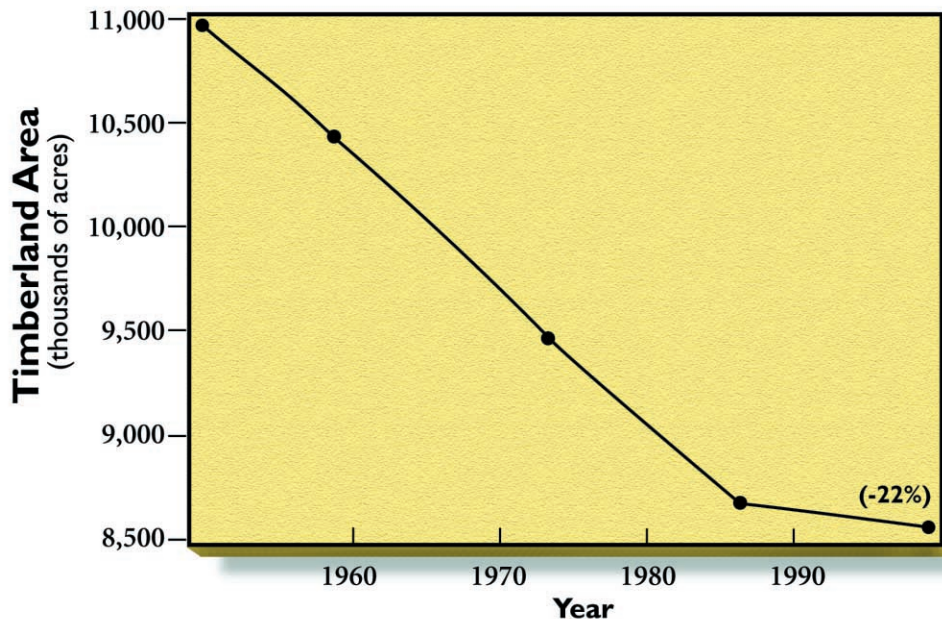
This is not to say that housing development in rural areas should not be a concern of forestry policymakers in the state. On the contrary, population growth rates projected for the future in western Oregon and the negative impact of population density on forest management suggest that forestry policymakers are justified in their concern.

Figure 19



LAND USE POLICY IMPLICATIONS

Figure 20 - Change in Private Timberland Area in Oregon, 1953-1997 (Adapted from Donnegan 2001)



Oregon's land use planning for forest lands (Goal 4 of the Land Conservation and Development Act, Senate Bill 100) is, "To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices ... as the leading use on forest land..." Many different policies are either explicitly or implicitly embedded in the statutes and rules that implement the forest lands goal.

The question policy makers can now address with new data and analysis is; are the laws working to support the forest lands goal?

Policy To Conserve Forest Land: *ORS 527.630 (1)* "... it is ... the public policy of the State of Oregon to encourage economically efficient forest practices that assure the continuous growing and harvesting of forest tree species and the maintenance of forest land for such purposes as the leading use on privately owned land ..."

Oregon's comprehensive plans were implemented in the early 1980s, coincident with slowing development of forests and farms. One possible explanation for the slowing rates of conversion of farms and forests is that the land use plans successfully encouraged development to stay within areas specifically zoned for urban expansion or rural residential development. However, declines in population and personal income growth rates also coincided with the slowdown in development, leaving questions about the cause of the decrease in development rates.

In the period from 1994 to 2000 the conversion rate of resource land dropped from 6,000 acres per year to 4,000 acres per year. In this period population and personal income growth rates were again high but the rate of development continued to slow. This is a good indication that the land use program has slowed the rate of resource land conversion (Figure 20).

The land brought into an urban growth boundary or a rural residential area is carefully chosen to minimize commercial impacts on the

farm and forest land base. It is therefore important to analyze how much of the conversion that took place was contained within these designated growth areas. To answer this question we overlaid the photo points with maps showing the zoning designations from county plans produced in the early 1980s. We found that 93 percent of the urban density expansion between 1982 and 2000 went inside the 1980s Urban Growth Boundaries.

However, only 43 percent of the 60,000 acres changing to low density residential uses from farms or forests between 1982 and 2000 was

Policy To Protect the State's Forest

Economy: *ORS 526.460 (2) "... it is the policy of the State of Oregon to provide conditions favorable for long term forestry investments that lead to increased management of and harvest from these lands."*

The effects of scattered residential development on commercial forest productivity are another policy concern that is addressed through the land use planning program. The results of recently published studies suggested that Oregon's policy makers were justified in their concerns about the negative impacts of rural housing development on forestry.

Albeit with a relatively small sample size in areas with development, our statistical analyses of the field plots in Oregon do indicate that the commercial forestry-related investments, such as pre-commercial thinning and planting after harvest, decrease slightly as dwelling density increases.

A large majority (65 percent) of Oregon's private forest land zoned for forest uses remains free from the effects of any population or development. However, the amount of land in the higher density classes

(defined in Table 12) has been increasing over time (Table 13), and about 23 percent of the private lands in western Oregon zoned for commercial forestry have currently a population density approaching or above 20 people per square mile. This statistic is up from 18 percent in 1974, and may indicate a reduction in the amount of forest land that is available for commercial forest management.



Sixty-five percent of western Oregon's private land zoned for forest uses is still free of the effects that population or development might have on forest management.

within lands zoned for rural residential or urban uses. That means that more than half of additions, approximately 34,000 acres, to low density residential land use (ie. nine or more dwellings per square mile and parcels averaging less than 80 acres) between 1982 and 2000 went into lands that were zoned for forest or farm resource production. Almost all the growth in low-density residential dominant use occurred prior to 1994.

Table 13– Percentage of Land Zoned for Forest Uses by Density Class (Private Land Only)

Year	Density Class					
	0	1	2	3	4	5
1973	68.6%	13.8%	12.7%	2.7%	1.3%	0.9%
1982	66.4%	13.4%	12.7%	3.9%	2.0%	1.5%
1994	65.3%	12.6%	12.5%	5.0%	2.4%	2.2%
2000	64.8%	12.0%	12.9%	5.5%	2.4%	2.4%

Even though forest policy makers have been concerned with the negative impacts from rural forest dwellings, Oregon’s land use program does not prohibit all forest dwellings or residential uses. Rather, it attempts to segregate the potential conflicts between commercial and residential uses and tries to control the growth of residential uses in a systematic way. Many counties have slight variations on the theme and call their zones by

different names, but in general there are five different types of non-urban land uses on forestland: commercial forest, small scale part-time forestry with a dwelling, mixed farm forest, rural residential, and non-resource. The different land uses are described through a combination of zoning options and rules that control new dwellings and land divisions (see Table 14).

Table 14– Generalized Zone Types and Dwelling Options on Forest Lands

Generalized Land Use Type	Commercial Forest	Small Scale Part-time Forestry with Dwelling	Mixed Farm Forest	Rural Residential	Non-Resource
Description	Large blocks of Commercial Forest	Smaller blocks of forest with a mix of commercial and residential uses	Smaller blocks of forest inter-mixed with agricultural uses	Residential Uses	Forestlands not suitable for commercial timber production
Dwelling Opportunities	Large Lot Dwellings (160-acre parcel or 200-acre ownership)	Large Lot, Template, and Lot of Record dwellings	Large Lot, Template, Lot of Record, Non-farm, and Farm dwellings	Dwellings allowed on all parcels	Dwellings allowed on all parcels
Land Divisions	80-Acre Minimum	80 acres or size that will protect current commercial activities	80 acres or size that will protect current commercial activities	Varies from about 2 to 10 acres	20- or 40-acre minimum
<p><i>Notes: “Lot of Record dwellings” are allowed on a parcel which was acquired by the present owner prior to January 1, 1985, if the parcel is composed of soil that is not capable of producing 5,000 cubic feet of wood per year of commercial tree species, and is located within 1,500 feet of a public road.</i></p> <p><i>“Template Dwellings” are allowed on parcels where all or part of 3 to 11 (depending on soil productivity) other lots or parcels that existed on January 1, 1993 are within a 160-acre square centered on the subject parcel, and at least three dwellings exist on the other lots or parcels.</i></p>					

Commercial Forest Zones: The majority of the forest in the commercial forest land use type designated in comprehensive land use plans is still dominated by commercial forest operations. These are generally areas with larger blocks of land and few if any dwellings. Land divisions are limited to an 80-acre minimum because it is the minimum parcel size judged by the Legislature to be large enough to protect commercial uses. Dwellings are allowed on ownerships that are large enough to generate a significant portion of a landowner's livelihood from commercial timber production. By rule, dwellings are allowed anywhere in the forest on 160-acre parcels or 200-acre ownerships. Dwellings are also allowed in areas with higher concentrations of existing development (i.e., "template

Small Scale Part-time Forestry with a Dwelling: Development in all commercial forest zones is managed through a set of rules. The pre-1993 rules controlling dwelling and land division approvals were subjective and difficult to implement. People purchased property without knowing if they could build on the land they were purchasing. This caused confusion, frustration, and litigation. The subjective rules also left some policy makers with nagging doubts about whether the rules, because of their subjective nature and uneven implementation, were adequate to protect commercial forest productivity. As a result, the 1993 Legislature created objective standards for new dwellings in all forest zones.

By creating these rules, the 1993 Legislature provided for part of the forest land base to be

Table 15 – Change in Area of Privately Owned Land Zoned Forest by Density Class, 1973-2000, Thousand Acres

Year	Density Class		
	0 and 1	2 and 3	4 and 5
1973-1982	-41	19	22
1982-1994	-31	13	18
1994-2000	-16	14	2

dwellings"), or for landowners that purchased smaller less productive parcels, in areas with county services, before the land use plans were completed (i.e., "lot of record dwellings").

Table 15 shows that areas with population densities above 20 psm, where reductions in forest management were found by Wear et. al. in Virginia, increased by almost 88,000 acres during the period between 1973 and 2000. About 42,000 acres zoned for commercial forestry were added to the highest density classes, 4 and 5, between 1973 and 2000. However, the rate at which these higher density classes were created slowed substantially in the period from 1994 to 2000. Since the economy was robust and demand for rural dwellings was high during that period, we attribute this result to the land use program.

used by small woodland owners who wanted to live on the property and practice part-time forestry. However, because this type of land use is associated with smaller parcel sizes (Row 1978) and increased population (Wear 1999), it produces less timber, and because residential uses can conflict with intensive commercial operations, the legislature limited growth of the small-scale part-time land use. Since smaller parcels are more desirable for residential uses, land divisions are limited to sizes that will protect the type of commercial forestry already existing in the area. The majority of new dwellings are limited to areas that already have substantial numbers of smaller parcels and dwellings.

We cannot precisely calculate the amount of forest land available for dwellings under the rules because we do not have information about individual land parcels. However, from the structure count information collected for this study, we can estimate that all of density classes 4 and 5 plus a substantial portion of density class 3 is available for landowners who want to practice part-time forestry and live in a dwelling on the property. In the forest zones of western Oregon, we estimate that there is



On lands zoned for farm use, the type of crops and the economic value produced per acre may change with development; nursery crops are high value, hay is low value.

between 75,000 to 110,000 acres in this land use.

The implicit policy contained in the law is to fill in areas that are already dominated by small, part-time uses, rather than putting new dwellings into areas without them. Table 16 shows that the majority of the new dwellings put in forest zones between 1994 and 2000

were located in areas that already contained higher dwelling densities. Fifty three percent of the new structures were located in density class 5, where the number of dwellings is highest, and only one percent of the new structures were located in areas with no existing dwellings.

Table 16 – Location of New Forest Dwellings between 1994-2000 by 1994 Density Classes, Private Land Zoned for Forest Uses (Percentage)

Year	Density Class					
	0	1	2	3	4	5
1994-2000	1.0%	6.5%	16.0%	8.9%	14.3%	53.2%

Table 17– Percentage of Mixed Farm/Forest Zones by Density Class, 1973-2000, Private Land, Thousand Acres

Year	Density Class					
	0 and 1		2 and 3		4 and 5	
	Thousand Acres	Percent	Thousand Acres	Percent	Thousand Acres	Percent
1973	57	47%	56	46%	9	8%
1982	42	35%	66	54%	13	11%
1994	36	29%	67	55%	19	16%
2000	34	28%	67	55%	21	17%

Mixed Farm Forest Zones: In areas with a mixture of farm and forest uses, some counties have created zones in their land use plans that are acknowledged under both the farm and forest goals. There are about 121,000 acres in these zones. Farm dwellings are allowed on parcels predominantly used for farm purposes, and forest dwellings are allowed on forested parcels, if the applicant meets the respective farm or forest dwelling approval criteria.

Development has been rapid in the farm/forest zones (Table 17). In 1973 about 47 percent of the private land in farm/forest was in a density class with little or no likely impact on forest management, but by 2000 over 72 percent of the farm/forest zones were in or approaching density classes where a reduction in forest management intensity is likely. Population densities are much higher in mixed farm/forest zones than in zones designated as primarily forest.

Rural Residential Zones: In rural residential zones some of the land is still in commercial production, but the predominant use of the land is as residential property (Table 18). To create a rural residential area, local governments must take an exception from the Forest and Farm Lands Goals by showing that the land is already “built and committed” to a residential use or that there is a compelling reason that the land should be zoned residential rather than forest or farm. The land can be divided into small parcels (generally about 2 –

10 acres), and a dwelling can be built on each parcel. There are about 450,000 acres of rural residential areas in land use plans in western Oregon. About 60 percent of the area is occupied by urban or low-density residential uses, and 40 percent is still available for future development.

Table 18 – Dominant land uses within rural residential zones, 2000

Dominant Land Use in Rural Residential Zones	Thousand Acres	Percent
Forest	74	16%
Agriculture	59	13%
Mixed Forest Agriculture	39	9%
Low Density Residential	273	60%
Urban	8	2%
Total	453	100%

Non-resource Zones: Areas of the forest that will not support commercial timber crops, and are not needed to maintain soil, air, water, and fish and wildlife resources, can be zoned as non-resource lands. These areas can then be made available for very low-density residential uses. However, most of the rural land in western Oregon is capable of growing either commercial farm or forest crops. Therefore, few counties have pursued this zoning option. Less than one percent of the private forest land base in western Oregon is zoned as non-resource land.

CONCLUSIONS

The Oregon land use program appears to be slowing the rate of conversion of resource lands to more developed uses in recent years. Statewide, from the 1950s to the present, Oregon has converted more than 20 percent of its privately owned forest land to non-forest uses. But in the period between 1994 and 2000, only 3,000 acres of private wildland forest in western Oregon—less than .05 percent—were converted to more developed uses. The rate of farmland conversion has also slowed. From 1994 to 2000 about 20,000 acres, approximately 1 percent, of private agricultural land in western Oregon was converted to non-farm uses, compared with 114,000 acres, about 5 percent, converted between 1973 and 1982, before the land use plans were in place.

Not only has the land use program reduced the overall rate of conversion of forest and farm lands in western Oregon to more developed uses, but it appears to have been successful at containing urban expansion within areas where planners with local knowledge have judged it will have the lowest impact on farm, forestry, and other non-urban uses.

However, dwelling density continues to increase within forest, agriculture, and mixed forest/agriculture dominant uses.

With land use change numbers through the year 2000, we are now able to provide more of the information about land use in western Oregon that was previously missing. For example, we estimate that:

- There are over 450,000 acres of rural residential land in land use plans in western Oregon. The percentage will vary in each county, but in total about 40 percent of the land area zoned as rural residential has yet to be developed.



Rates of conversion of agricultural land drop as distance from low-density residential or urban areas increases.

- There are between 75,000 and 110,000 acres in lands zoned for forest use and between 40,000 and 60,000 acres in farm-forest zones that are available for use by landowners who want to have a mixture of small scale forestry and residential uses.

The full impact of such development on active forest management remains difficult to assess. Our analysis of forestry activities in western Oregon suggests a considerably weaker relationship between population density and forest management than that found by Wear et al. in four Virginia counties. This may be because Oregon's land use system provides greater stability and certainty for landowner investments in commercial forest crops. Even so, we have found small but statistically significant negative relationships between forest stocking rates and increased population density. We also found that the likelihood that private forest owners will invest in planting trees following harvest and in pre-commercially thinning their forest stands diminishes somewhat as population density increases.

However, no statistically significant relationship was found between population density and the likelihood that forest owners will harvest timber. Currently, Oregon's forestland owners seem to be willing to harvest their timber if it is commercially valuable.

Our results do point to the possibility that in the future the productivity of western Oregon's forests could be affected even by low-density residential development. If there are fewer investments in silvicultural stand improvements over time and forest stocking declines, the potential for commercial timber production will significantly decrease in areas with high levels of residential development.

The Oregon land use laws relating to forestland provide for a mix of land uses. The policy question has always been, "How much of each type of use should be provided and where should it be located?" In the past, the Oregon Legislature had limited information estimating the amount of land in different uses and projecting the changes that different policy options would make to the size of the land base and its productivity.

Many of the 1993 legislative discussions centered on how much of the forest land base would have residential or small-scale, part-time dwelling opportunities. We estimate that about 180,000 acres of rural residential land are still available for development in western Oregon and between 115,000 and 170,000 acres of forest land are available for people who want to

live on the land and practice small scale, part-time forestry. More detailed data from around urban areas could help more strongly confirm, or ultimately change, our findings.

Overall, there are many encouraging signs about land use on western Oregon's highly productive forests and farms.

- Land use change seems for the most part to be occurring where it has been anticipated and planned for.
- Eighty-nine percent of non-federal land in western Oregon remains in forest and agricultural uses.
- Despite increased population and income growth in the last six years, development in resource lands has remained at a very low level.
- Only 2 percent of the wildland forest, 2 percent of the mixed forest/agriculture, and 7 percent of the intensive agriculture is classed as developable based on comprehensive land use plans.
- A large majority (65%) of Western Oregon's private land zoned for forest uses is still free of the effects that population or development might have on forest management.

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APPENDIX—DETAILED INFORMATION

- Table A1** Changes in the area of non-Federal lands in western Oregon, by dominant land use class and date of photography, 1973 to 1982, 1982 to 1994, and 1994 to 2000
- Table A2** Total non-Federal land area in western Oregon by owner class and dominant land use classes, 1973, 1982, 1994, and 2000
- Table A3** Average structures per square mile on non-Federal lands in western Oregon by dominant land use and ownership classes, 1973, 1982, 1994, and 2000, for land remaining in the same land use classification between 1973 and 2000
- Table A4** Average structures per square mile on non-Federal lands in western Oregon, by dominant land use class, date of photography and analysis area, 1973, 1982, 1994, and 2000, for land remaining in the same dominant land use class between 1973 and 2000
- Table A5** Total non-Federal land area in western Oregon by owner and structure count classes, 1973, 1982, 1994, and 2000

Table A1 – Changes in the area of non-Federal lands in western Oregon, by dominant land use class and date of photography, 1973 to 1982, 1982 to 1994, and 1994, to 2000^{ab}

Dominant Land Use Class	1973 Acres to 1982 Dominant Uses						1982 Acres to 1994 Dominant Uses					
	1973 Acres	Wildland Forest	Intensive Agriculture	Mixed Forest/Agriculture	Low-Density Residential	Urban	1982 Acres	Wildland Forest	Intensive Agriculture	Mixed Forest/Agriculture	Low-Density Residential	Urban
		Thousand Acres					Thousand Acres					
Wildland Forest	7,335	7,235	4	16	80	1	7,238	7,198	2	9	28	1
Intensive Agriculture	2,076	3	1,962	7	72	32	1,967	--	1,940	1	12	12
Mixed Forest/Agriculture	832	--	--	767	62	3	791	1	1	765	18	5
Low-Density Residential	518	--	--	--	491	26	704	--	--	--	692	12
Urban	316	--	--	--	--	316	378	--	--	--	--	378
Total Area	11,078	7,238	1,967	791	704	378	11,078	7,200	1,943	775	751	407

Dominant Land Use Class	1994 Acres to 2000 Dominant Uses						
	1994 Acres	Wildland Forest	Intensive Agriculture	Mixed Forest/Agriculture	Low-Density Residential	Urban	
		Thousand Acres					2000 Acres
Wildland Forest	7,200	7,197	--	--	2	1	7,197
Intensive Agriculture	1,943	--	1,924	--	3	17	1,924
Mixed Forest/Agriculture	775	--	--	774	1	--	774
Low-Density Residential	751	--	--	--	747	4	753
Urban	407	--	--	--	--	407	429
Total Area	11,078	7,197	1,924	774	753	429	11,078

-- = less than 500 acres or none found.

^a Totals may be off because of rounding.

^b Does not include land that shifted to or from non-Federal ownership between 1973 and 2000.

Table A2 – Total non-Federal land area in western Oregon by owner class and dominant land use classes, 1973, 1982, 1994 and 2000^{abc}

Dominant Land Use Class	Forest Industry			Nonindustrial Private			Other Public			All Owners		
	1973	1982	1994	2000	1973	1982	1994	2000	1973	1982	1994	2000
Wildland Forest	4,403	4,397	4,392	4,391	1,863	1,779	1,747	1,745	1,067	1,061	1,059	1,059
Intensive Agriculture	45	44	44	44	1,922	1,818	1,798	1,781	109	105	102	99
Mixed Forest/Agriculture	51	50	50	51	716	678	662	661	64	62	62	63
Low-Density Residential	12	21	25	25	467	638	677	677	38	45	49	49
Urban	4	5	5	5	257	313	342	361	55	60	61	64
Total Area	4,517	4,517	4,517	4,517	5,226	5,226	5,226	5,226	1,333	1,333	1,333	1,333

Thousand Acres

^a Totals may be off because of rounding.

^b Owner class is from a 1997 inventory of non-Federal forest land in western Oregon; owner class for 1973 and 1982 was not determined.

^c Does not include land that shifted to or from non-Federal ownership between 1973 and 2000.

Table A3 – Average structures per square mile on non-Federal lands in western Oregon by dominant land use and ownership classes, 1973, 1982, 1994, and 2000 for land remaining in the same land use classification between 1973 and 2000^{abcd}

Dominant Land Use Class	Forest Industry			Nonindustrial Private			Other Public			All Owners		
	1973	1982	1994	2000	1973	1982	1994	2000	1973	1982	1994	2000
Wildland Forest	0.58	0.84	1.04	1.15	5.61	9.43	11.63	13.09	0.93	1.70	2.03	2.18
Intensive Agriculture	9.83	12.00	14.09	15.83	16.13	20.60	24.32	26.88	11.93	18.43	25.91	27.21
Mixed Forest/Agriculture	4.08	6.23	8.08	8.62	10.41	14.03	18.19	20.84	10.87	12.27	17.65	18.87
Low-Density Residential	42.46	52.00	58.77	64.31	75.49	98.68	120.83	133.58	73.13	100.82	121.95	143.28

Structures Per Square Mile

^a Structure counts were not taken on points classified as urban.

^b Structure counts were determined by counting the number of structures within 80-acre circles surrounding each plot.

^c Does not include land that shifted to or from non-Federal ownership between 1973 and 2000.

^d Owner class is from a 1997 inventory of non-Federal forest land in western Oregon; owner class for 1973 and 1982 was not determined.

Table A4 – Average structures per square mile on non-Federal lands in western Oregon, by dominant land use class, date of photography and analysis area, 1973, 1982, 1994, and 2000, for land remaining in the same dominant land use class between 1973 and 2000^{abcd}

Analysis Area	Date of Photography	Dominant Land Use Class				Low-Density Residential
		Wildland Forest	Intensive Agriculture	Mixed Forest/Agriculture		
		<i>Structures Per Square Mile</i>				
North Willamette Valley Counties	1973	3.19	18.75	13.16	80.29	
	1982	4.55	23.92	18.39	113.12	
	1994	5.32	28.53	22.36	136.78	
	2000	6.17	31.66	26.75	161.00	
South Willamette Valley Counties	1973	0.57	8.26	12.99	71.16	
	1982	2.60	11.56	17.98	95.46	
	1994	3.09	12.90	23.78	109.22	
	2000	3.68	14.50	25.98	118.69	
North Coast Counties	1973	1.87	19.17	15.61	82.90	
	1982	2.67	26.23	19.18	106.44	
	1994	3.19	28.54	23.33	122.90	
	2000	3.40	30.13	24.10	131.35	
Southwestern Counties	1973	1.87	21.93	7.25	68.70	
	1982	2.76	26.48	9.21	80.61	
	1994	3.63	34.03	13.20	109.44	
	2000	3.92	36.30	14.56	116.24	
Western Oregon	1973	1.85	15.77	10.04	74.48	
	1982	3.05	20.30	13.38	97.67	
	1994	3.76	24.18	17.49	119.36	
	2000	4.20	26.65	19.88	132.58	

^a Structure counts were not taken on points classified as urban.

^b Structure counts were determined by counting the number of structures within 80-acre circles surrounding each plot.

^c Does not include land that shifted to or from non-Federal ownership between 1973 and 2000.

^d Owner class is from a 1997 inventory of non-Federal forest land in western Oregon; owner class for 1973 and 1982 was not determined.

Table A5 – Total non-Federal land area in western Oregon by owner and structure count classes, 1973, 1982, 1994, and 2000^{abc}

Structure Count Class	Forest Industry			Nonindustrial Private			Other Public			All Owners		
	1973	1982	1994	2000	1973	1982	1994	2000	1973	1982	1994	2000
<i>Counts Per Square Mile</i>												
0-4	4,300	4,248	4,211	4,192	2,362	2,082	1,921	1,857	1,097	1,082	1,069	1,065
5-8	118	130	139	148	822	752	741	717	68	60	60	59
9-16	39	51	59	59	515	512	482	480	30	34	36	34
17-32	34	50	59	61	541	610	616	608	31	38	34	33
33-64	14	23	30	35	392	500	540	560	24	24	30	31
65-96	3	3	6	7	138	198	239	257	11	15	17	17
96+	4	6	7	9	197	270	363	386	16	21	28	30
<i>Thousand Acres</i>												
0-4	7,760	7,414	7,414	7,203	7,760	7,414	7,414	7,114	7,760	7,414	7,203	7,114
5-8	1,008	942	940	925	1,008	942	940	925	1,008	942	940	925
9-16	585	597	576	573	585	597	576	573	585	597	576	573
17-32	607	698	709	703	607	698	709	703	607	698	709	703
33-64	430	547	601	626	430	547	601	626	430	547	601	626
65-96	152	216	262	281	152	216	262	281	152	216	262	281
96+	217	298	399	424	217	298	399	424	217	298	399	424

^a Structure counts were not taken on points classified as urban.

^b Structure counts were determined by counting the number of structures within 80-acre circles surrounding each plot.

^c Does not include land that shifted to or from non-Federal owner class between 1973 and 2000.

